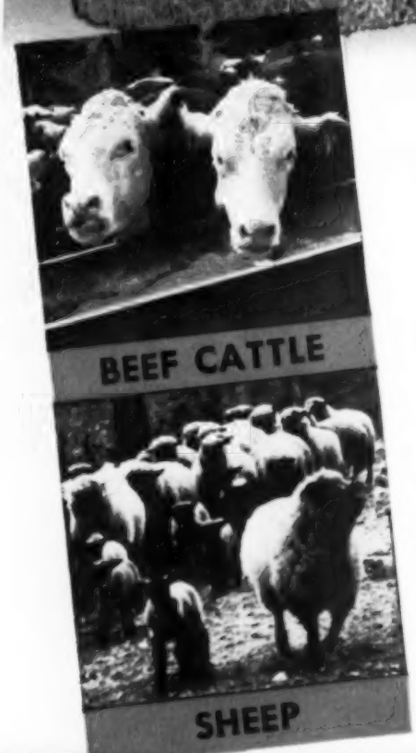
AGRICULTURAL CHEMICALS

AGRICULTURAL INSECTICIDES • FUNGICIDES • STOCK DIPS AND SPRAYS
FUMIGANTS • DAIRY FARM CHEMICALS • WEED CONTROL CHEMICALS • FERTILIZERS
SOIL TREATING MATERIALS • SEED TREATING CHEMICALS • RODENTICIDES

Volume III April, 1948 Number 4



Baker's DDT

helps produce *more meat* and *milk*

Spraying livestock with DDT is fast becoming standard practice on farms and ranches. The reason is easy: It pays off in more milk—extra beef—bigger lambs *... at no extra feed cost!*

Results from tests and personal experiences are convincing farmers rapidly. Spraying dairy cows with DDT increases milk production from 8 to 20% during fly season . . . spraying beef cattle increases gains from ½ to 1 lb. per day during fly-time.

A federal entomologist figures *every pound of DDT* used on beef cattle on one ranch added 1,202 lbs. gain . . . in another case 1,285 lbs. . . . on a third ranch 2,306 lbs.

Treating sheep with DDT, it has been found, almost completely stops death losses due to ticks—gives bigger lambs at market—more and better grades of wool.

The rapidly expanding use of DDT on livestock offers a big opportunity to the insecticide formulator. Get set now for the coming season.

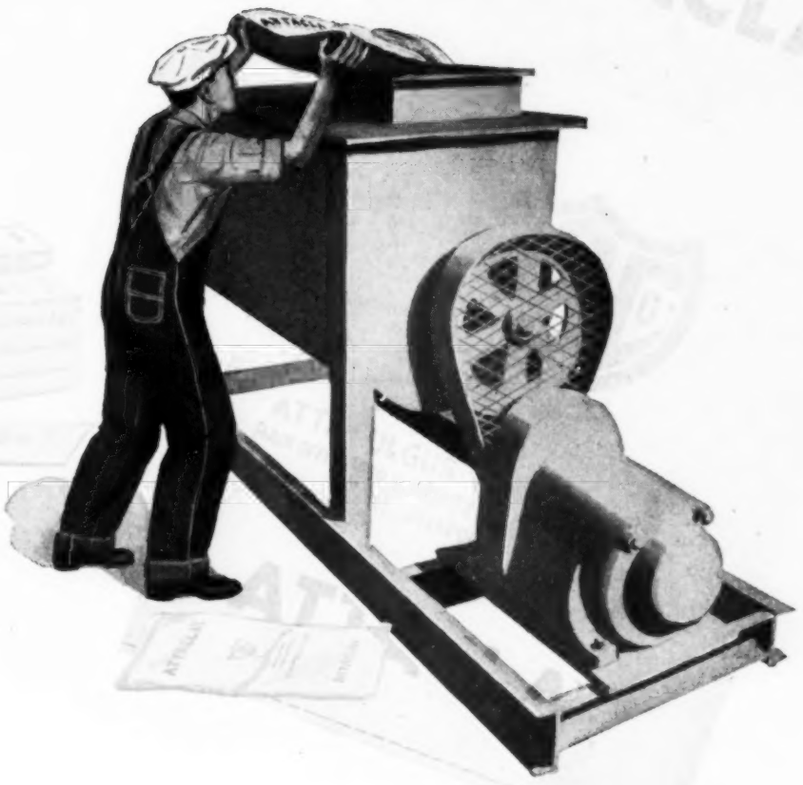
Baker offers you a granular DDT approaching a white color, with a minimum setting point of 89° C. It is uniform in color, makes a clear solution, is free flowing and uniform in particle size. This enables the manufacturer to perfect his mix before grinding.

Baker's DDT comes in 25, 50, 100 and 200 lb. containers. We invite you to write for prices and tell us your requirements. Address *Agricultural Chemical Division*, J. T. Baker Chemical Co., 66 S. Main Street, Phillipsburg, N. J.

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

Can the CARRIER *"Make"* or *"Break"* a dust?



"Yes", say many investigators, makers and users of dust concentrates or finished dusts. So, alert agricultural chemical people first ask, then work to answer such vital questions as:

"Will this carrier or diluent interfere with the activity of the toxicant?"

"Will it ease production steps?"

"Will it impart the required dusting characteristics?"

Attaclay is a carrier and diluent that "welcomes" such intensive research. For where the going's been the toughest, Attaclay has produced the following *wanted* results:

Greater Killing Power Per Pound of Finished Product—Attaclay's unusual adsorptivity makes possible the production of highest-percentage concentrates or finished dusts with chlorinated camphene, benzene hexachloride, chlordane, DDT, etc. Yet the end product is dry, uniform, lump-free.

More "Continuous" Operating for Dust Maker or User—Attaclay's freedom from caking and lumping—called flowability—means trouble-free flow through processing and dusting equipment.

Cheaper Maintenance—Attaclay does not induce abnormal wear on mixing or grinding machines or dusting rigs.

Cheaper Pest Control—Attaclay exhibits excellent characteristics as regards dispersion and even coverage.

Performance—with Formulation Savings—Attaclay has inherent wetting action on "hard-to-wet" toxicants. Its suspensibility is within the required range—is readily modified to meet specific formula needs.

Flexibility—with Safety—Attaclay's broad range of chemical compatibility is well-established.

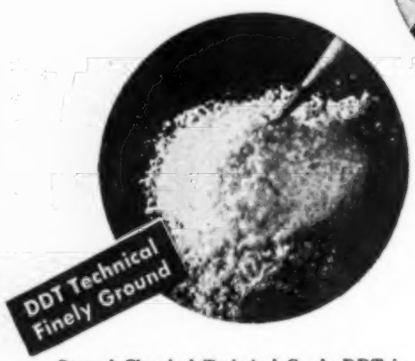
May we send you a generous sample—then help prove that Attaclay is the *right* material for your formula?

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Philadelphia 5, Pa.

DDT

Technical Grades and
Dry Wettable Concentrates
Dust Base Concentrates
Emulsifiable Concentrates
Solvent Concentrates



General Chemical Technical Grade DDT is available in either the *finely ground* or the small, *thin flake* types that insure easy handling and processing in your milled or oil-base products. The flake type offers processing efficiencies and economies that are well worth investigating. Samples available.

BASIC CHEMICALS

GC

FOR AMERICAN INDUSTRY

General Chemical's DDT materials are developments of research, production and quality control facilities that are among the nation's foremost. This combination—together with nearly half a century of experience and leadership "in insecticides"—is your assurance that you will always obtain DDT materials of uniformly high quality on every purchase from General Chemical. For your needs . . . write or phone nearest General Chemical Office below.

GENERAL CHEMICAL DDT PRODUCTS:

- DDT TECHNICAL, Finely Ground
- DDT TECHNICAL, Thin Flake
- GENITOX* S-50 (50% DDT Wettable, Microfine)
- GENITOX D-50 (50% Dust Base, Microfine)
- GENITOL* EM-25 (25% Emulsifiable)
- GENITOL EM-30 (30% Emulsifiable)
- GENITOL SC-30 (30% Solvent Concentrate)
- GENITOL SC-40 (40% Solvent Concentrate)

*Reg. U. S. Pat. Off.

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Makers of the Nation's Foremost ORCHARD BRAND SPRAYS + DUSTS *Insecticides and Fungicides*

Offices: Albany • Atlanta • Baltimore • Birmingham • Boiton • Bridgeport • Buffalo • Charlotte Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles • Minneapolis New York • Philadelphia • Pittsburgh • Portland (Ore.) • Providence • San Francisco • Seattle St. Louis • Wenatchee • Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Tremendous mounds of potash in storage at Trona California, by American Potash & Chemical Corporation. Notice the elaborate equipment for handling and loading the material. For complete story on potash supplies during two world war periods, see page 23, this issue. (Photo courtesy American Potash Institute, Washington, D. C.)

APRIL 1948
VOL. III No. 4

A Monthly Magazine For the Trade

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AGRICULTURAL CHEMICALS

Subscription Rates: *One year* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00. *Published monthly on the 15th by Industry Publications, Inc. Office of Publication, 123 Market Place, Baltimore 2, Md. Advertising and editorial office, 254 W. 31st St., New York, 1, N. Y. Advertising rates made known on application. Closing date for copy—25th of the month previous to date of issue.*

Entered as Second Class Matter at the Post Office at Baltimore, Md., under the Act of March 3rd, 1879.

STOP HIM

with Chlordane

OCTA-KLOR *BRAND* (T.M. REG. U.S. PAT. OFF.)

HE TAKES A PRODIGIOUS CHUNK OUT OF THE NATIONAL FARM INCOME

Multiply this fellow a billion times and you will have some idea of the grasshopper problem — and market. The grasshopper invasion extends from Maine to California, from Texas to Canada — no section and no crop is immune to its destructive appetite. Be prepared to furnish this market with adequate amounts of Chlordane dusts and sprays to take this pest and his co-workers, the alfalfa weevil and Lygus bug, out of circulation.

Chlordane is the most economical means of combating these pests because it is the most effective.

1. One pound (1 lb.) of Chlordane per acre properly formulated into dusts or sprays gives simultaneous control of the grasshopper, alfalfa weevil, and Lygus bug.
2. 'Hoppers stop feeding immediately following application of Chlordane insecticides, thus preventing crop destruction.
3. A single application of a Chlordane insecticide remains effective up to three weeks; hence, avoiding necessity for frequent treatment, with consequent savings in labor, application and material costs.
4. Chlordane insecticides are easy to work with, pleasant to apply in a variety of methods: airplane dusting, mechanical spray rigs, *and hand or mechanical dusters*. Grasshopper control with Chlordane is effective control.

Chlordane is available in Agricultural and Refined grades, both of which are 100% active insecticidally, for the formulation of agricultural, veterinary, household and industrial insecticides. Complete technical information is available on request.

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Send coupon for *FREE* supplements

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Gentlemen: Please send me copies of the following:
☐ Technical Supplement No. 201-A, Direct Control of Grasshopper, Alfalfa Weevil, and Lygus Bug.
☐ Technical Supplement No. 207, Control of Cotton Insects.
☐ Technical Supplement No. 208, Control of Plum Curculio.

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City..... State.....

Dust deserves a chance

proper application assured with

HUDSON Stauffer KNAPSACK DUSTER

There's extra effectiveness in every pound of dust you make, sell or buy—when that dust is *properly applied.* By proper application we mean the *uniform distribution* of dust on every part of every plant—underside as well as topside of foliage. We mean the application of the *proper amount* of dust—not too much, not too little. That's the kind of effective, insect-killing, blight-resisting dusting the Hudson Stauffer Knapsack Duster gives.

Thousands of these dusters, as perfected by Hudson, went into service during 1947 alone to give growers a new conception of efficient application. Uniform discharge of dust under perfect control at all times, economical dusting and new ease of operation is the Hudson-Stauffer combination that gives dust a chance to do its best work.

Just a puff or a blast. Ideal for spot-dusting of individual plants or fruit... equally efficient for complete coverage of plants . . . with discharge rate under perfect control always.

Easy to operate. A quick push on the handle is enough to send out clouds of dust. Conveniently located feed lever gives easy control of discharge rate.

Long-Life bellows. Made of tough, mildew-resistant Dupont material. Flexes easily, instantly for a long life of full efficiency.

Easy to fill—Giant capacity. Built-in scoop on cover makes filling easy. Duster holds 18-20 pounds of average density dust.

H. D. HUDSON MANUFACTURING CO.
Chicago, Illinois

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HITTING INSECTS WHERE THEY LIVE

Monsanto greenhouse insecticide potency tests

Here, in Monsanto's greenhouse laboratories, the effectiveness of each Monsanto insecticidal chemical is proved before it is released for commercial use. Supervised by entomologists Philip P. Wallace and J. Marshall Magner, experiments under actual greenhouse conditions are continually being conducted on a wide variety of insects, including spider mites, aphids, stored-products insects, fabric pests, mealy bugs and vegetable crop enemies such as cabbage worms and bean beetles.

This broad insecticidal development program is another example of Monsanto's service to industry and agriculture — helping greatly to reduce the enormous annual damage caused by insect pests.

Cherry leaf beetle, *Galerucella cavicollis* Lec.

An enemy of cherry, plum and apple trees that may be successfully controlled with proper formulations containing Santobane. Approximately 10 times natural size.

Proper formulations of Santobane will provide effective control of insect pests in the four major groups — household, premise, agricultural and animal. Santobane kills in two ways — as a stomach or contact poison — and can be used with equal success in dusts, wettable powders, solutions, emulsifiable solutions and aerosols.

Manufacturers and formulators of insecticides will find Santobane easy to work with. Its uniform, free-flowing, granular characteristics permit it to be readily emulsified, solubilized or milled. Priced to move in a competitive market, Santobane is always available for immediate shipment.

SEND FOR YOUR COPY OF NEW 28-PAGE BOOKLET ON SANTOBANE. Contains detailed specifications, application and formulation data, including comprehensive list of insects against which Santobane is effective.

Santobane: Reg. U. S. Pat. Off.

no residual-toxicity problems NIFOS-T

Freedom from the harmful effects of residual toxicity is one of many valuable features of Nifos-T (Monsanto Tetraethyl Pyrophosphate, Technical). This is particularly important in the case of truck-garden crops—where harvesting delays often prove costly.

Nifos-T is also an *economical* contact-killer for orchard, farm and greenhouse pests. Less expensive than nicotine compounds—dilute spray solutions, aerosols and dusts containing Nifos-T are deadly to aphids, mites, thrips and many other insect pests. Nifos-T is compatible with most fungicides, wetting agents, spreaders and other compounds used in insecticidal formulations.

More detailed technical and application data are contained in a new Monsanto folder on Nifos-T. For your copy, write to MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri, or ask for it on the convenient coupon.

MONSANTO 2,4-D
effective weed control

Selective control of many of the most stubborn agricultural and lawn weeds is readily achieved with proper formulations of Monsanto 2,4-D. An economical herbicide, 2,4-D is furnished by Monsanto as either insoluble 2,4-D Acid, or water-soluble 2,4-D Sodium Salt.

Formulators and processors are invited to get in touch with Monsanto regarding their 2,4-D requirements. Although present supplies are somewhat limited, inquiries will be given prompt attention.

☆ ☆ ☆

MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Akron, Cincinnati, Charlotte, Birmingham, Houston, Los Angles, San Francisco, Seattle. In Canada: Monsanto (Canada) Limited, Montreal.

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CHEMICALS AND PLASTICS

SERVING INDUSTRY... WHICH SERVES MANKIND

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Engineered to the special requirements of

CHEMICAL SPRAYING MACHINES

Norgren

- Strainers
- Relief Valves
- Hose Assemblies
- Manual Control Valves
- Pressure Regulating Valves

With "know-how" from years of manufacturing air filters, hose assemblies, and many types of valves for American industry coast to coast—Norgren engineers have gone *away out front* on designing components to help manufacturers of chemical spray machines solve critical problems. If your chemical spray machine requires a better strainer, relief valve, pressure regulating valve, manual control valve or hose assembly—CHECK WITH NORGREN!

Write C. A. Norgren Company, 222 Santa Fe Drive Denver 9, Colorado

Norgren

"VELSICOL 1068"

"VELSY" RIDES AGAIN!

King Cotton Finds a Powerful New Ally

Yes, "VELSICOL 1068" Chlordane has demonstrated that it is sure death to boll weevils, grasshoppers, curculio and other agricultural insects. It also prevents aphid build-up and is effective against such cotton insects as green stink bugs, cotton flea-hoppers and tarnished plant bug. In preventing emergence of a new generation of boll weevils, "VELSICOL 1068" Chlordane reduces the number of applications necessary for sure control of this pest.

Other Velsicol Corporation agricultural products:
AR 50; AR 60; AR 70

Note: "VELSICOL 1068" Chlordane is compatible with dusting sulphur. When red spider is a problem, 40% sulphur is recommended.

Like a marshal of the roarin' bad towns of the old west, "VELSICOL 1068" cleans up in a hurry and has the pesky Boll Weevil on the run pronto. Let this modern nemesis of the evil Boll Weevil ride herd for you. Here's a hard ridin', straight shootin' hombre they don't cotton to, suh! On the square, suh! "VELSICOL 1068" gets 'em "in the square—before they're born, that is, — and so they don't have a chance to harm your crop nohow.

formula

"VELSICOL 1068"	
Chlordane	10%
Inert Carrier	90%
Total	100%

"1068" "VELSICOL" CHLORDANE

VELSICOL Corporation

Manufacturers of: Insect Toxicants • Aromatic Solvents • Resins • Coresin Core Oils

General Offices: 330 East Grand Avenue, Chicago 11, Illinois
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G. E. Missbach, Atlanta 3 • Natural Products Corp., Montreal

U.S. DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
GRAIN CONSERVATION ON FARMS, 1947-48
GRAIN MUST BE CONSERVED TO-
1. HELP HUNGRY PEOPLE ABROAD
2. STRETCH OUR OWN FEED SUPPLIES
FARMERS CAN DO THEIR SHARE BY:
Marketing hogs at lighter weights
Putting less finish on beef cattle
Providing more hay, roughage, and pasture for dairy cattle
Culling poultry flocks
THIS HANDBOOK CONTAINS OTHER SUGGESTIONS FOR SAVING GRAIN

HOW

YOU can help this government program

The Anti-Inflation Bill just passed by Congress directs the President, through the Department of Agriculture, to carry out a program for the conservation of food and feed.

You, as an insecticide manufacturer, can help this program by pushing your products and your know-how for the control and eradication of insects and rodents.

The Powell Company, as basic manufacturers of insecticide, rodenticide and weed control materials, can help you help this program. We offer you all the cooperation that our quarter century of experience is worth. Our technical staff will help you in selecting materials. Our sales staff will help you to promote them.

Among the Powco Brand products you should use and promote in this program are:

- **Cattle grubs**.....Cube Powder
- **Rodent Control**.....Antu
- **Poultry lice, ticks, etc.**.....BHC (Benzene Hexachloride)
- **General Insect Control: Animal parasites, stored grain insects, cattle insects, agricultural insects nuisance insects, etc.**
  - PYRIN #20
  - BHC
  - JP-25 (25% DDT emulsion)
  - JP-30 (30% DDT oil soluble)
  - JP-50 (50% DDT powder)
  - JP-50W (50% DDT wettable powder)
- **Weed Control (cereals, corn, flax)** 2,4-D

How the new government program can help YOU

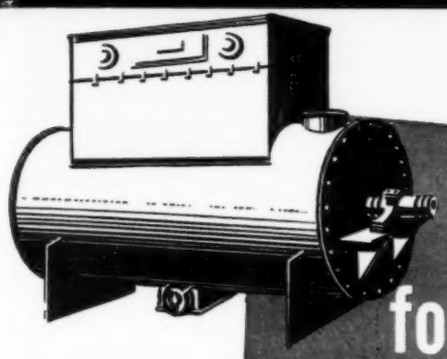
The government has initiated a nationwide publicity program emphasizing the need to save grain and feed. Detailed literature, posters, recommendations and other forms of promotion are now in the hands of all State Extension Directors for their use. In addition, the full cooperation of trade associations and other interested groups has been enlisted. Here's a great opportunity for Insecticide Manufacturers like yourselves to develop this program. What's more, you'll profit by its success.

Make your plans today and let us know how we can help you.

John Powell & Co., Inc.

ONE PARK AVENUE NEW YORK 16, N. Y.

SALES OFFICES: CHICAGO - SAN FRANCISCO - PITTSBURGH - PHILADELPHIA - ST. LOUIS
CANADA: CHARLES ALBERT SMITH, LTD., TORONTO - MONTREAL
In Argentina—John Powell Y CIA, Condarco 1535, Buenos Aires, Argentina, Telephone 59, Paternal 0021.
POWCO BRAND PRODUCTS: Antu - Pyrin R - Pyrin D-20 - JP No. 10 - JP No. 25 - JP No. 30 - JP No. 50 - JP No. 50W - Pyrethrum Powders and Extracts - Stimtox "A" - Rotenone Powders - Sabadilla - Aerosol Formulas - 2,4-D - BHC (Benzene Hexachloride) - HETP (Hexaethyl Tetraphosphate).



Active Ingredients for Dusts that Boost Sales

DITHANE Z-78 A new organic fungicide containing 65% zinc ethylene bisdithiocarbamate. Dusts based on DITHANE are effective against many diseases of potatoes, tomatoes, celery, cucurbits and tobacco seedlings . . . a safe, all-round fungicide. Compatible with DDT, RHOTHANE, rotenone, and calcium arsenate.

YELLOW CUPROCIDE A "fixed copper" containing 90% yellow cuprous oxide, 80% metallic copper equivalent. Ultra fine particles of CUPROCIDE—one micron or less—blend with insecticidal ingredients and diluents to make dusts that are recognized for their exceptional fungicidal ability and long residual effectiveness.

Write for recommended formulations and prices.

RHOTHANE AD-50 A dust concentrate containing 50% dichloro diphenyl dichloroethane. Effective against the insects controlled by DDT—definitely superior to DDT on some insects including tomato horn worms and corn earworms. *Only 1/8 - 1/10 as toxic as DDT to warm blooded animals—¼ as toxic as DDT to honey bees.*

ROHM & HAAS Products Serve the Industry

MANUFACTURERS: Rohm & Haas supplies basic ingredients for insecticidal and fungicidal formulations—including wetting, spreading, emulsifying and conditioning agents.

DISTRIBUTORS: Rohm & Haas offers a unique line of Agricultural Insecticides and Fungicides.

BRANCH OFFICES: Chicago, Kansas City, Los Angeles, Oakland. Canadian Distributor: P. N. Soden & Co., Ltd., Montreal and Toronto. Represented by Cia. Rohm y Haas, S. R. L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities.

D-50 DUST A 50% DDT dust concentrate consisting of micron-sized particles in a diluent which improves the adhesive qualities of dusts in which it is used.

DITHANE CUPROCIDE *and* RHOTHANE. *are trade marks, Reg. U. S. Pat. Off.*

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5 PA

Manufacturers of Chemicals including Plastics • Synthetic Insecticides • Fungicides • Resins • Detergents
Germicides • Chemicals for the Leather, Textile, Ceramic, Rubber, Paper, Petroleum and Agricultural Industries

Here's how to *Produce better crops!*

Spray weeds to death with

2-4 Dow Weed Killer

Good farmers the country over are getting profitable results with this scientific, *low-cost* way to get ahead of weeds—and keep ahead of weeds—without backbreaking hoeing, mowing and cultivating in the hot sun.

Spray weeds, growing in crops such as small grains, flax, corn, sugar cane, rice, peas, sorghum, and grass grown from seed, with 2-4 Dow Weed Killer. Weeds wither and die—crops flourish to produce *greater yields per acre.* Consult your weed control commission and state experiment station. Full directions for use are outlined on the familiar Dow drum.

SEE YOUR DEALER—ASK YOUR COUNTY AGENT

OTHER DOW WEED KILLERS

- Dow Selective Weed Killer
- Dow Contact Weed Killer
- Esteron 44
- Special Dust Mixtures

AGRICULTURAL CHEMICAL DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

FIELD NOTES

DOWKLOR DOOMS THE GRASSHOPPER

Voracious grasshoppers—for centuries a major cause of crop losses throughout the world—have at last met their Waterloo! Most types of crawling insects, too, fall easy victims to Dowklor, powerful new Dow Chlordane insecticide. Roaches, ants, bedbugs, beetles, silver fish, mosquitoes, fleas, lice, flies, spiders, ticks, house centipedes and a long list of similar pests are effectively exterminated through Dowklor's combined contact, stomach poison and fumigant action. Formulations for many uses are available.

QUICK-ROOT SPEEDS ROOT GROWTH OF CUTTINGS AND SLIPS

Nurserymen, greenhouse operators and home gardeners in increasing numbers use Quick-Root for successful propagation of plants from cuttings and slips. Quick-Root hastens the initiation of roots, increases the number of roots per cutting and aids greatly in survival and growth of cuttings. Dow offers Quick-Root No. 1 for a wide variety of cuttings; and Quick-Root No. 2 for certain cuttings which normally root with more difficulty.

KNOCK-OUT DROPS FOR WOODY UNDERGROWTH

Poison ivy and its weedy, woody cohorts are in for a bad time when Esteron 44 goes into action. This powerful new, chemical brush killer blitzes woody brush and tough perennial weeds from fence rows, highways, rights-of-way, ditchbanks and pastures. Besides poison ivy, its deadly spray knocks out wild honeysuckle, alders, locust, mesquite, sumac and other woody pests.

DOW SPROUT INHIBITOR STOPS POTATOES SPROUTING IN STORAGE

Sprouting of potatoes in storage, with the resultant loss of weight, food value and marketability can be prevented with Dow Sprout Inhibitor. Its use means also that potato storehouses can be kept warmer and that potato sugar content stays lower. It works equally well with carrots, turnips and other root crops. (Naturally, it is *not* recommended for seed potatoes nor for bulbs or roots to be planted out.)

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

One More Weapon for Winning Bigger Yields!

THE MORE-POWERFUL APHICIDE AND MITICIDE

Westvaco research and manufacturing again team up to provide an "even-better" insecticide.

Westvaco's powerful new Agricultural Chemical contains 40% TEPP, the active ingredient of HETP (which contained only 12%—20% TEPP). Now, with this two to three times more potent miticide you can offer your customers greater protection against aphids, mites, thrips, mealybugs and leafhoppers.

One of America's largest integrated producers of Agricultural Chemicals, Westvaco offers you a *dependable* source of supply...and assurance it will continue to develop and manufacture even better Agricultural Chemicals.

DEVEX 'T'* (DDT Technical) • DEVEX D-50* (50% DDT Dry Dust Concentrate) DEVEX W-50* (50% DDT Wettable Dust Concentrate) • TRIVEX 'T'* (Benzene Hexachloride Technical) • TRIVEX D-50* (6% Gamma Isomer Benzene Hexachloride Dry Dust Concentrate) • TRIVEX W-50* (6% Gamma Isomer Benzene Hexachloride Wettable Dust Concentrate) • 3-5-40 COTTON POISON (3% Benzene Hexachloride—5% DDT Technical—40% Sulphur) • FOSVEX* (40% Tetraethyl Pyrophosphate) • SOILFUME 60-40* and SOILFUME 80-20* (Ethylene Dibromide Mixtures for Soil Fumigation) • GRAIN FUMIGANT Mixtures (Nos. 3, 4, 5, 6, 7 & 8.) METHYL BROMIDE

For Prices, Delivery Schedules and Technical Data address
AGRICULTURAL CHEMICALS DIVISION.

WESTVACO CHLORINE PRODUCTS CORPORATION
405 LEXINGTON AVENUE • NEW YORK 17, N.Y. • MU 9-4920

*Trade Mark

2,4-D

AVAILABLE under your own private brand name or our Stantox 2,4-D label

With 12 year's experience in the manufacture and field use of *selective* weed killers, we are now in a position to offer Agricultural Chemical Distributors or Processors a complete line of 2,4-D Weed Killers. All of our products have been thoroughly tested in practical field tests by our trained technicians and have been approved by all leading agricultural authorities.

STANTOX "70"

Dry 2,4-D (Sodium Salt)—In 1947, grain farmers all over the country reported excellent results in the control of annual weeds with Stantox 2,4-D dusts and sprays. With more and better spraying and dusting equipment now available, this market is bound to increase many times over.

STANTOX "66"

2,4-D (Liquid Amine Salt)— This liquid 2,4-D concentrate is very popular because it can be used in low volume spraying. Its complete water solubility makes it an easy, economical spray for selected killing of broad-leaved annual weeds in certain crops and lawns. Thousands of acres of small grains, rice and corn were commercially sprayed by ground rig and plane using a volume of 5 to 10 gals. of Stantox "66" 2,4-D spray per acre.

STANTOX "P-44"

2,4-D (Isopropyl ester of 2,4-D)—To round out the Stantox 2,4-D line we offer Stantox "P-44" for "hard-to-kill" woody perennials and mature weeds. Here again, the action is "selective", as Standox "P-44" clears weeds from pastures, irrigation ditches, roadsides, etc., without affecting the desired grasses. It also can be used for low-volume spraying on corn, rice and small grains.

2,4-D
ACID
SODIUM SALT
ISOPROPYL ESTER
TRIETHANOLAMINE SALT

[redacted]

Effective • Plentiful Lower Priced . . .

Here are reasons for putting pyrethrum in your insecticide:

For *immediate control* of a broad range of insects, pyrethrum is widely used—either alone or combined with slow-acting chemicals such as DDT and chlordane. In combinations of pyrethrum and DDT it has been found that the total insecticidal value is greater than the sum of the value of each.

Non-poisonous, safe and *efficient,* pyrethrum has become an established contact insecticide in many commercial fruit and vegetable growing areas. No washing of fruits and vegetables is necessary after its use.

In all *aerosol formulations,* pyrethrum is an essential ingredient.

Supplies of pyrethrum are adequate and there is no indication of any shortages.

Price of pyrethrum is at last reverting to prewar levels and, in view of its well-established advantages, its use is expected to gain momentum rapidly.

Write us for complete information.

Specific for flies and mosquitoes, pyrethrum controls many important insects in addition to those mentioned below:

- Ticks
- Fleas
- Lice
- Roaches
- Cucumber Beetles
- Tarnished Plant Bug
- Thrips
- Black Aphids
- Strawberry Leaf Roller
- Strawberry Flea Beetle
- Rose Chafer
- Mushroom Flies
- Cabbage Looper
- Imported Cabbage Worm
- Asparagus Flea Beetle
- Cranberry Fireworm
- Cranberry Fruitworm
- Blunt-Nosed Leafhopper
- Blackheaded Fireworm
- Cranberry Weevil
- Squash Bug
- Stink Bug
- Cut Worm
- Currant Worm
- Horn Worm
- Watermelon Beetle

S. B. PENICK & COMPANY • ASHEVILLE • NEW YORK • CHICAGO • HIPPOCRATES

frianite

a FREE FLOWING insecticide diluent that "works easy"

FRIANITE is a processed anhydrous alkali aluminum silicate, *definitely on the acid side* (pH range 5.4 to 6.5). Designed distribution of particles makes Frianite easy and effective to use.

FRIANITE is as close to neutral as practical for general agricultural application. Superior adhesive qualities. Moisture is less than 1%. Bulk density is about 47 lbs. per square foot.

FRIANITE improves insecticides...makes them flow freely and work easier. Because Frianite is a superior diluent, it is effective and economical to use anywhere in the United States.

Send for Free Booklet on "FRIANITE"

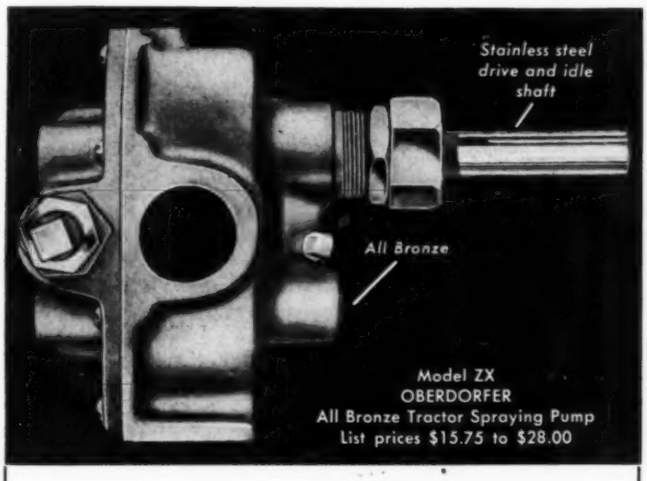
FRIANITE is shipped direct from our plant at Friant, California, in 100 lb. kraft bags. Superior qualities of FRIANITE *make it economical to use all over the U.S.*

CALIFORNIA INDUSTRIAL MINERALS CO.

"Producers of FRIANITE" ★ **FRIANT · CALIFORNIA**

HOW CAN OBERDORFER SELL BRONZE TRACTOR SPRAYING PUMPS AT SUCH LOW PRICES?

Because Oberdorfer Bronze Rotary Gear Pumps cost so little,—less even than ordinary iron pumps of comparable capacity—buyers are constantly asking, "How can Oberdorfer produce such high quality bronze pumps for so very little money?"



1. No corrosion with bronze and stainless steel.
2. Pressures up to 150 pounds per square inch.
3. Built-in adjustable pressure relief valve.
4. Lower cost than iron of similar design.
5. No priming to 15 feet below pump.
6. Four large Alemite lubricated bearings.
7. Easily installed by any mechanic.
8. ¼", ⅜", ½", ¾" and 1" standard pipe connections.
9. Backed by 50 years of bronze pump manufacturing.
10. All metal — no rubber.
11. From 2 gallons to 600 gallons per acre.

Here is how we do it:

FIRST, we have been making pumps of this same general type for 51 years—long enough to have learned all the ways of keeping pump production costs down without any sacrifice of quality.

SECOND, castings are a big share of pump costs and since Oberdorfer is one of the largest non-ferrous foundries, we naturally make all our own castings. This assures constant high quality at lowest cost.

THIRD, Oberdorfer sells bronze pumps of almost identical design in enormous quantities in a diversity of markets. Oberdorfer Pumps similar to those used in tractor spraying and other agricultural installations are sold to the chemical industry, to industry in general through mill supply houses, to the marine field (both engine manufacturers and marine hardware dealers) and to the fire-fighting equipment field. This high degree of standardization and very large volume reduces our costs.

FOURTH AND LAST, Oberdorfer has always deliberately kept its pump prices down, regardless of temporary fluctuations in costs. We have long since learned that low price means greater volume. Actually, we have made only a single 15% increase in price in the last 10 years!

THE RESULT? As practically all pump buyers know, Oberdorfer Pumps have virtually no competition in their size range. They are the *standard* which all others must meet.

Farm equipment manufacturers and dealers will be glad to know that with our increasing facilities for bronze pump manufacture the supply this season will be adequate very shortly. There will be no reason for any weed spraying equipment being offered without the economy and quality of Oberdorfer Bronze Tractor Spraying Pumps.

Agricultural Pump Division, Oberdorfer Foundries, Inc.
5300 Thompson Rd. — Syracuse, N. Y.

Most customers are tough to please . . . but the toughest is the trained technician who's looking for loopholes in your insecticide, rodenticide, fungicide or weed killer. Please him—and you're certain of pleasing the ultimate consumer.

Pleasing your trained technicians is a Powco specialty. Powco Brand products are chemically standardized and biologically tested to maintain highest quality—and highest, quickest kill at all times.

Laboratory technicians like the fact that they can rely on Powco products. Their uniformity is guaranteed, so that no changes in end-formulations need ever be made. For this reason, more and more manufacturers choose Powco products.

Another Powco specialty is service. Powco technical knowledge and experimental facilities are there to serve you and your technicians. Investigate today.

Products: Antu, Pyrin #20, Pyrin R, Pyrin D-20, JP #10, JP #25, JP #30, JP #50, JP #50W, Pyrethrum Powders and Extracts, Stimtox "A", Rotenone Powders, Sabadilla, Aerosol Formulas, 2,4-D, BHC (Benzene Hexachloride), HETP (Hexaethyl Tetraphosphate)

THE EDITOR COMMENTS

THE effect of government competition in business has long been felt keenly by a number of industries, but few to such a pointed degree as the fertilizer industry. For over a decade now, the Tennessee Valley Authority has been operating a mammoth phosphate plant at Muscle Shoals with perhaps the largest potential capacity of any plant in the world. Its products have been distributed to thousands of farms in 30 states. TVA has expanded its operations to include the manufacture of nitrogen fertilizer materials in addition to phosphates. It is wooing Congress in hopes of obtaining approval for an additional eight million dollar phosphate plant at Mobile, Ala., well outside the Tennesse valley watershed.

The fertilizer industry has been keenly aware of these goings-on for a long time, but any lingering doubt must have been removed when a recent Government-published booklet, "Food at the Grass Roots" appeared to laud TVA activities and at the same time to belittle the efforts of the private fertilizer industry. In reference to the billion-dollar government fertilizer program, this interesting statement appeared:

> "What had been regarded by some of the sponsors of the act as incidental and collateral had become, in the view of TVA's directors—and of many of the nation's farm leaders as well—the major activity of the Authority, to the accomplishment of which, of course, the dams and power plants were instrumental and highly necessary."

If there are still those who think that the U. S. Government has no serious intent of continuing in the agricultural chemical business, such persons should take another look at the picture. TVA has already taken one step in this direction by producing defluorinated phosphate.

Current emergencies in the supply situation might seem to lend logic to the cry for more government participation in business. It is hard for the farmer to understand why certain materials should be short in the face of such an enormous expansion in production facilities. But, the fertilizer dealer and others who come into direct contact with the ultimate consumer are in a good position to counteract such propaganda. By relating how the private fertilizer producer has met the emergency and has risen to unprecedented heights in the production of needed plant food materials during and since the war, the facts are made clear.

Government has a way of placing its foot in the door of industry, keeping it there and using the opening for vast expansion. It is a matter which the fertilizer industry has long faced, but happens to be taking in stride at the moment. But don't assume that the crack in the door won't open wider. The government foot is a big one!

IN a recent announcement to members, the GLF Cooperative Exchange, Ithaca, N. Y. stated that since 2,4-D is a relatively new material and its research and experiments have been limited to the past two or three years, the co-op will neither recommend nor encourage any patron to use the product on an extensive scale.

However, if patrons wish to use 2,4-D on a small portion of their acreage on crops such as corn, winter or spring wheat, oats or barley, asparagus beds, grass pastures, grass hay fields or on woody plants or hedgerows, the co-op will furnish the material, under its own label, to patrons at the most desirable formulation for the job to be done. No dust containing 2,4-D will be sold by the Exchange.

There is, of course, every justification for warning users of 2,4-D to apply it with caution. Such admonitions are needed, just as a highway sign which says "Go Slow—Road Under Construction." This implies that when the road is completed and it is safe to proceed at normal speed, permission will be given.

No argument exists regarding the tremendous potential usefulness of 2,4-D in agriculture. But,

it is also a tool which must be used with care, in correct concentrations, at the right time and in the right places. No doubt the GLF wishes to emphasize that growers must not make use of such a powerful weapon willy-nilly as yet. Costly mistakes can be and have been made in application. Since this is true, GLF is apparently maintaining that the product must be used sparingly in limited areas where the grower is sure there are no useful plants are to be destroyed.

In the Pennsylvania, New York and New Jersey areas served by GLF, there are great numbers of varied crops, some of which may be even more susceptible to 2,4-D than the weeds which are intended to be killed, the co-op's announcement states. It warns further, that the effects of 2,4-D are not always confined to the immediate area to which it is applied.

But with its proved ability to increase crop yields and to kill weeds previously impossible to control, 2,4-D must not be arbitrarily condemned because unwise use in some instances has brought bad results. Let the dealer and the user follow the recommended procedure, and no trouble is likely to result. Caution is definitely in order until the "Road under construction" sign is gone. Research is working toward this end.

THE rather substantial number of unfortunate episodes which have resulted in the last few months from the misuse of some of the newer insecticidal and herbicidal materials has caused a certain amount of serious thinking on the part of insecticide manufacturers particularly because of their realization that additional similar episodes may occur in 1948. Apprehension on this subject is more or less general, but it can be doubted if even now many insecticide manufacturers have a full realization of the extent of their responsibility. The manufacturer, meaning the company which puts out the finished product and whose name and address appears on the label, is really on the spot in such cases.

The last three years have seen the introduction of more new chemicals and new techniques than ever before in a like period. Even more extraordinary than the number of new products has been the indiscriminate enthusiasm with which each newcomer has been welcomed, accepted, and recommended. Manufacturers have contributed their part by the natural desire to exploit new products for all conceivable purposes, and to a surprising degree growers have not only accepted recommendations and claims with enthusiasm, but in many instances have adopted practices going beyond recommendations and running counter to warnings.

There has been too little consideration given to the fact that hazards are involved in the use of economic poisons and that aside from a few outstanding exceptions they should not be used or recommended without an adequate background of knowledge of their shortcomings and limitations, and their toxic and other hazards. Owing probably to the perculiar mass psychology induced by the wartime DDT publicity, the necessity for adequate appraisal of new materials has in many cases been largely forgotten, sometimes even by State and Federal authorities.

When in addition it is realized that users have shown a tendency to go far beyond recommendations or directions and to ignore warnings, it is not surprising that some disasters have occurred and that more are in prospect. It must be admitted that many of the practices certain to be in use during the 1948 season are of at least doubtful wisdom, and that many of them are ill-advised and possibly hazardous. The situation constitutes a serious hazard to the industry.

There is room for ample difference of opinion as to the degree of hazard and opportunity for plenty of argument as to the relative degree of blame to be attached to individuals, agencies, and influences which may have contributed to this rather serious situation. The point made here is that whatever the causes, the insecticide manufacturer who supplies the finished materials under his own name and label is right squarely on the spot. The fact that he merely may have been following the lead of Federal and State agencies and supplying recommended products for recommended uses is at best only partial protection, if any, when something goes wrong. Legally, financially, and practically the manufacturer is the responsible party. It is far easier for one to stay out of trouble than to get out once he is in; and extreme caution is one of the best ways to stay out.

POTASH

Market conditions met by the fertilizer industry during two war periods; 1914-18 and 1939-44 analyzed and compared

BEFORE 1914 and World War I, all potash consumed in the United States had to be imported. Today, some thirty-odd years later, practically all potash consumed in the United States is produced in the United States. American production of potash today is about four times greater than the average total U. S. imports and consumption prior to 1914. Of this increased supply of potash, agriculture uses approximately ninety per cent, industry ten per cent. In the 16,000,000 tons of fertilizer produced in the United States in 1947, a million tons of potash figured as K_2O was used, which in gross tonnage of potash salts probably approximated one and a half million tons. Potash at the war peak was estimated as a $30,000,000 industry.[1]

Comparing the record of potash availability and potash prices during the first and second World Wars reveals some very striking contrasts. The average fertilizer manufacturer, blender or mixer, if he happened to have been in business back in 1914, may or may not remember the details. All he may realize today is that during the recent war, potash was available for normal needs at low prices. In fact, American potash prices have not changed essentially in ten years, and the level at which prices have stood is *less than half* of the cost of imported potash back in the "normal" market prior to 1914.

During the actual war years of World War I, 1915 through 1918, imports of potash into the United States totaled 44,000 tons, an average of 11,000 tons per year. For the three years, 1916, 1917 and 1918, imports totaled only 2,000 tons. For the same three years, American production showed its early figures of 9,700 tons in 1916, 32,500 tons in 1917, 54,800 tons in 1918, a total of 95,000 tons,—all basis K_2O,—only to slump in 1919 to 32,000 tons with the end of the war and the resumption of imports. For all the years of World War I, the *average yearly availability* of potash, that is the total amount available for use by American agriculture and industry combined, was 35,000 tons. Translated into current 1947 needs of agriculture, this figure would be in essence no potash at all, something like 3% of present requirements.

Prices during the World War I period likewise reveal an interesting series of contrasts to those of World War II. Starting at 79c per unit in 1914, prices rose as high as $9.87 per unit in 1916. For the three war years, 1915-17, they averaged about $7.50 per unit, equivalent to about $450. per ton for 60% muriate of potash. That American agriculture turned to every other conceivable means of getting potash into the soil was not due to this high price alone. The potash was simply not to be had irrespective of price. Only when American production began to expand to any appreciable size in 1917 was there slight relief to the acuteness of the scarcity, and then far from sufficient relief to have any material effect in lowering prices, which still hovered between $6 and $8 per unit ($360 to $480 per ton of 60% muriate) for two years.

Prices Constant for 10 Years

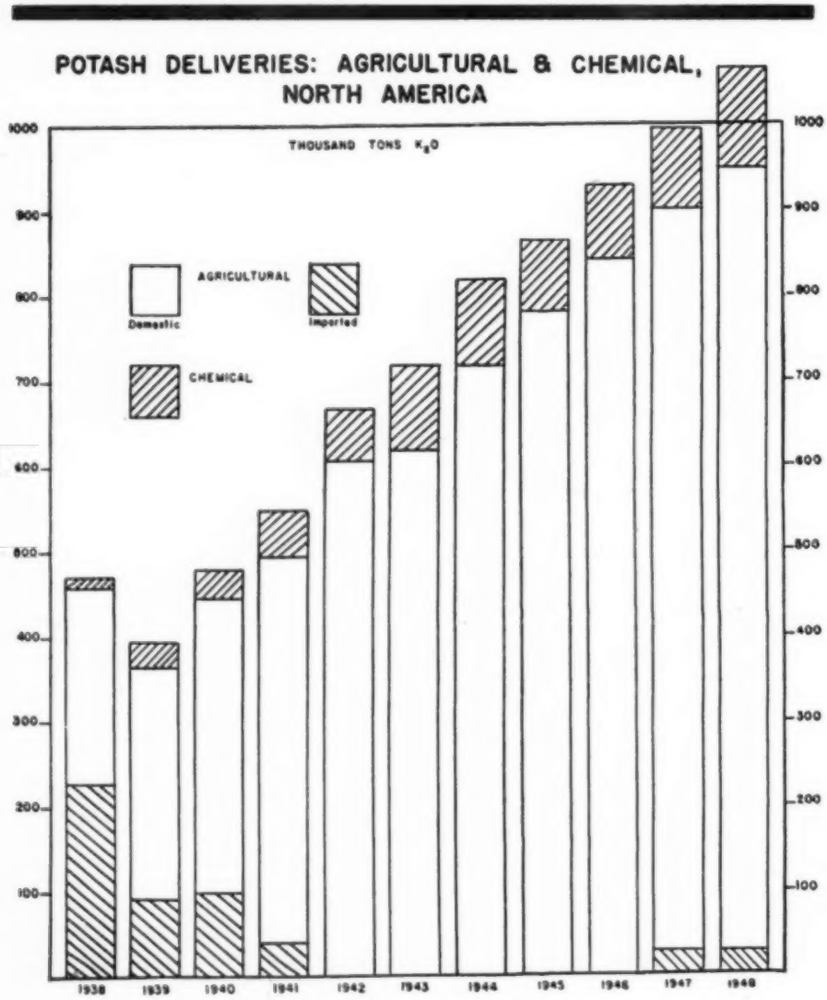
CONSIDER, by contrast, the years of World War II in potash prices and availability. In 1939, American production of potash salts was 312,000 tons, basis K_2O. That same year, the U. S. imported 100,000 tons. In short, Europe was still a considerable factor in the American market, supplying some 25 per cent of potash consumed. But when by 1941 most of the European

[1] "The Economics of the Potash Industry," ules Backman, New York Univ. School of Commerce, Accounts and Finance, 1946, American Potash Institute.

potash was shut off from the U. S. market, American producers had jacked up their output to 525,000 tons. By 1944, this figure had moved up to 835,000 tons with imports negligible. But with the end of the war and a continuation of the upward movement in demand to supply not only the heavy American needs for fertilizers in expanded food production, but to aid the post-war agriculture of Europe, output of American potash in 1947 exceeded a million tons.

The price-story of American potash during World War II is brief. For ten years, the price remained unchanged. Through the period when foreign imports were cut off, when war demand exceeded the ability of the potash industry to expand its production rapidly enough, and through the continued heavy demand of the post-war period, potash prices remained basically the same, 42.3 cents per unit, fob mines, at Carlsbad, N. M. The rate remained at this level until the beginning of the current fiscal year at which time it dropped to its present quotation of 37.5 cents per unit, fob mines. Wartime controls were removed about two years ago, but no advance in price occurred as in the case of most other chemicals. Whether this policy is in anticipation of potential low-price competition from Europe is something which the producers alone have determined. But in the light of demand and price movements in the great majority of chemicals during the past two years, higher potash prices would not have been a great surprise in the fertilizer field.

Of the 1,030,000 tons of potash salts (calculated on basis of K_2O) produced and shipped in the U. S. during 1947, about 80 per cent was in the form of sixty per cent muriate. About 3 per cent was as manure salts running approximately 25 per cent basis K_2O, about 7 to 8 per cent of the total was fifty per cent muriate, about 8 to 10 per cent was potassium sulfate, and 2 to 3 per cent was miscellaneous flue dusts and other forms of potash. For the same period, imports probably aggregated about 10,000 tons. In this latter connection, it is interesting to note that the U. S. Department of Commerce in reporting imports of 3,029 tons of muriate of potash from France in November, 1947, stated that this was the first importation of potash into the United States since last May.



—The American Potash Institute, Inc.

Background of American Potash

THROUGHOUT the development of the potash industry in the United States, its expansion even during World War II, when the Government was pouring money into all sorts of industrial ventures, was privately financed. Unlike some other industries where there have been comparatively few producers, the commercial success of the potash industry did not result from a series of mergers. Rather it has been the result of (1) relatively few sources of potash in the U. S. which can be worked profitably, (2) principal deposits being located on government land and the cessation by the government in granting permits in 1934 to prevent overdevelopment, and (3) the relatively large development costs compared with the sales volume of the industry. A brief outline of the historical background in the mining and processing of potash salts, and the competitive and other factors in the market which had to be met, reveals the confused and unpromising beginnings from which the present industry rose.

At the start of World War I, the Germans had a world monopoly on potash salts. This monopoly came into being back in 1861 when the Germans first mined the natural bed of salts near Stassfurt. They won complete control of the world trade in this basic fertilizer material when the only other known workable beds in adjacent Alsace came into German hands at the close of the Franco-

Prussian War. During the early stages of World War I, as a spur to encourage the United States to induce Britain to loosen her blockade, the Germans embargoed the export of their potash. It quickly became a real famine chemical in the Western Hemisphere and the price went from $44.25 a ton to $483.63.[2]

This meant that while the American farmer was paying 76 cents for each unit of potash (in terms of K_2O) before the war, at the peak in December, 1915, he was forced to pay about ten dollars per unit. After a full year of World War II, when no more potash came out of Germany and France than in 1914-15, he paid roughly fifty per cent less than when the German monopoly controlled supplies.

The only muriate of potash in the U. S. in 1915 were small odd lots. When the price soared, frenzied efforts were made to recover it from wood ashes, cement-mill flue dust, distillery slops, and from minerals such as the New Jersey greensands, Wyoming leucit, Utah alunite and the natural salt deposits and briny lakes of the west. Production of muriate of potash was started at Searles Lake, California before the end of World War I, but the output of this development was low and it did not prevent muriate prices from soaring to unbelievable heights.

Europe Undersells U. S. Potash

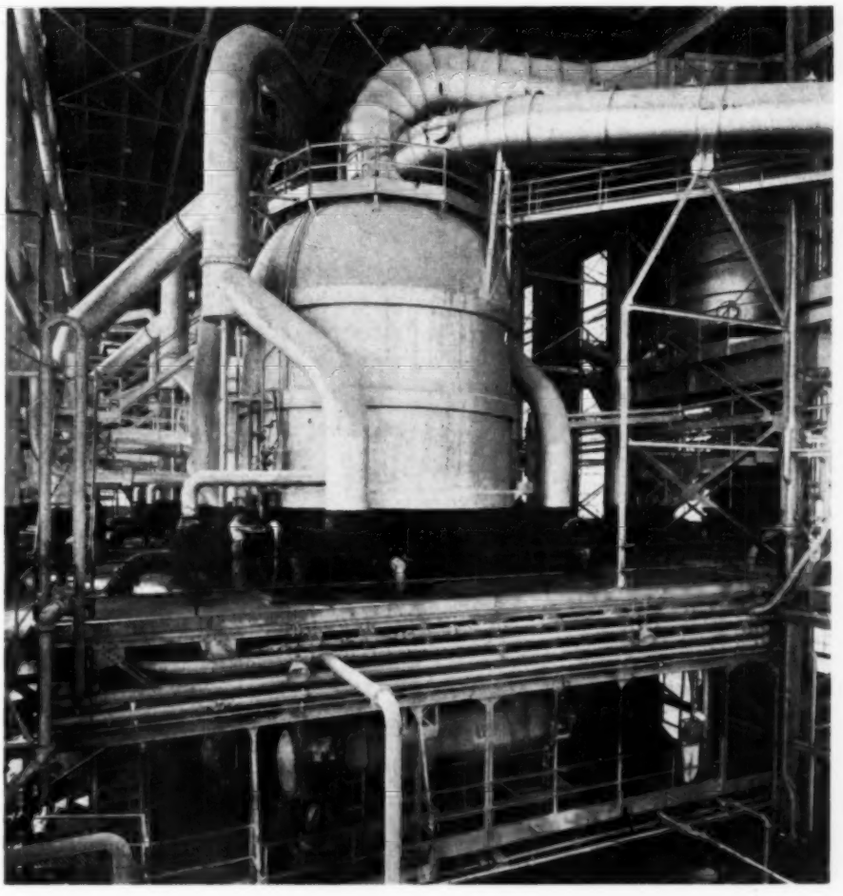
MONEY appropriated by Congress in the twenties provided for an investigation of natural potash salts in our southwest. Near Carlsbad, New Mexico, the Potash Company of America, United States Potash Company and International Minerals and Chemical Corporation are now mining beds of sylvinite, a mixture of sodium and potassium chlorides, from potash-bearing seams eight to fourteen feet thick. These potash beds appeared from time to time in oil-drilling cores, and after the Snowden-McSweeney Oil Co. had found the rich Carlsbad sylvinite bed, Congress appropriated half a million dollars in 1926 to explore for potash on Government-owned lands in that region.

Between 1926 and 1930, the Snowden-McSweeney interests spent over $600,000 in core-drilling in this area and three other private prospectors were also actively exploring the region. There was proved up an area of some 50 square miles, beneath which lie beds of sylvinite four or more feet thick. Estimated reserves are close to 200,000,000 tons, a quarter of which runs 28 per cent K_2O or better—material about twice as rich in potash as the famous Stassfurt deposits.[2]

In the years after the first World War, German and French producers had buried the hatchet regarding competition and formed a cartel which sold in the United States through a single agency. It was then possible to bring foreign potash into the United States to sell well below domestic *production costs*. With any sort of tariff on fertilizer materials fought tooth and nail by the farm bloc, a venture into potash production, even from the promising Carlsbad beds had extraordinary risks.

In spite of this, operations were begun at Carlsbad in 1931. Almost immediately the company faced an unexpected hazard. For several years, the price of imported potash had been maintained somewhat lower than before the war, at approximately 70 cents per unit. Then Spain and Russia, both new potash producers outside the cartel, began dumping potash on the American market. The price dropped to as low as 30 cents per unit at just the time the American mines were getting into production and continued low for four years. And the American producers had set up their cost figures on the basis of a selling price of 70 cents per unit, C.I.F. American ports.

Giant potash evaporators installed by American Potash and Chemical Corporation, Trona, California. Note men standing on two levels. (Photo courtesy of American Potash Institute, Washington, D. C.)



2 "This Chemical Age," Williams Haynes, 1942, Alfred A. Knopf, Inc., New York, Chapter XX.

The first commercial potash produced at Carlsbad was a crushed raw ore. However, the price war, developing the early thirties, threatened to destroy the infant industry if it continued to ship this type product. Concentration of the ore by solution, evaporation and crystallization and later flotation methods permitted shipment of potash in the form of a potassium chloride (muriate) concentrate which minimized transportation costs. In this process, the sylvinite ore is finely ground and carried to the flotation machines in a saturated solution of the ore itself. In the machine, the saturated solution carrying the potash ore is agitated by means of air, and surface-active flotation agents are added which create a froth, bringing to the surface either the potash muriate or the other material, from which the potash is to be separated, depending on the method of treatment, thus completing the desired separation.

At Searles Lake, California, where the American Trona Corp. (now the American Potash and Chemical Corp.) first started during World War I, a concentrated mixture of salts (sodium chloride, gypsum, borax, potash and others) is found in a great natural lake of white slushy salts permeated by a brine. The brine is pumped to the nearby processing plants where it is concentrated in triple effect evaporators 86 feet high, in which common salt (sodium chloride) precipitates. On cooling, the concentrated liquor deposits crude muriate of potash which is refined to a basis of about 60 per cent K_2O. Borax is produced from the same brine by agitating it after the potash salts have been deposited from the quiet liquor.

What's Ahead?

ALTHOUGH raw material costs in the post-war period have not advanced a great deal, labor charges, freight rates and equipment costs have increased. Greater production facilities have resulted in lower production costs, however, and this has served somewhat to balance off increases in other costs. An increase of 10 per cent in freight rates occurred in the fall of 1947 and another increase of perhaps 15 per cent is considered likely.

How about the future outlook for imports? No tariffs protect the American producers of muriate. There is a possibility that the potash production in the leading countries of Europe will be government-owned-and-controlled and that potash may be dumped in the United States in order to create dollar exchange. There is the further possibility that potash, received in the form of reparations, may be sold direct to American users. And there is always the possibility of powerful new potash cartels being formed in the future by the countries in Europe. A method of protecting the American potash industry against such possibilities would be the establishment of an important quota system based on consumption of potash in the United States, a subject now under discussion.

The record of the potash industry demonstrates that it has been able to meet effectively the demands of its customers by expanding production rapidly. At the same time, the long-term trend of prices has been downward and wartime prices remained unusually stable. There thus appears no basis in fact to justify the insistence of certain groups that the government should intervene in this industry on a major scale. In the words of Willard L. Thorp and Ernest A. Tupper, U. S. Department of Commerce, who submitted a report on the potash industry to the Department of Justice in May, 1940: "It appears that the potash industry has demonstrated clearly those factors of pioneering development, tech-

(*Turn to Page 75*)

Basis K_2O?

EXPRESSING the potash content of fertilizers, as well as potash salts, as K_2O is seldom given a second thought by manufacturers. But among local mixers, dealers, and users, the expression, K_2O, is often an unsolved puzzle. If the potash is present in the fertilizer or salt as potash muriate (potassium chloride) why indicate it as K_2O, which is potassium oxide, strictly a non-commercial chemical compound? That it is the chemist's common denominator in expressing the potash content of all compounds requires further detailed explanation for those who do not understand the reasons. The same applies to P_2O_5 the "common denominator" for phosphorus and phosphates. And to a "unit" of potash in salts and fertilizers.

With the thought in mind that there are those who would like to read a concise explanation of these and other terms, an article, "What the Dealer Should Know About Fertilizers," is in course of preparation by Dr. Colin W. Whittaker, USDA fertilizer expert and a member of the Editorial Advisory Board of AGRICULTURAL CHEMICALS, and planned for early publication. This will be one of a series of "What the Dealer Should Know" articles embracing fertilizers, insecticides, fungicides, weed control chemicals, and others, all by outstanding leaders in the respective fields.—The Editor.

POTASH SUPPLY
World War I Period
(in thousands of short tons)

Year	Total Supply	Imports	Domestic Production	Price Range $/unit K_2O
1913	255	255	—	.76
1914	194	194	—	.78
1915	43	42	1	1.18-9.87
1916	11	1.3	9.7	5.98-9.27
1917	33	0.5	32.5	6.76-8.66
1918	55	0.2	54.8	5.64-6.90
1919	61	29	32	2.17-5.54
1920	246	198	48	2.13-2.93

From figures of U. S. Bureau of Mines and Dale C. Kieffer, "Potash Report," 1941.

POTASH SUPPLY
World War II Period
(in thousands of short tons)

Year	Total Supply	Imports	Domestic Production
1936	459	212	247
1937	636	351	285
1938	511	194	317
1939	412	100	312
1940	495	115	380
1941	538	13	525
1942	683	4	679
1943	756	17	739
1944	840	5	835
1945	880	6	874
1946	936	4	932
1947*	1030	10	1040

* Estimated

From figures "Minerals Yearbooks" and The American Potash Inst.

Despite Insects, Plant Disease, Weeds . . . Food Production Rises Because of

Chemical Pest Control

by

By Charles F. Brannan*
Assistant Secretary of Agriculture

ANY enlightened layman in the field of agricultural pest control must be impressed by the tremendous scope of the problem faced in controlling insects and fungus diseases, and by the remarkable extent to which scientific research has been able to overcome these problems. Department of Agriculture entomologists report that in the field of injurious insects alone, some 600 species of primary importance are known to exist in the U. S., and many more of lesser importance.

In discussing the future of our food and feed conservation work, it should be stated that this need will obviously not end with the next harvest. Before recommending to the Congress how much food we might reasonably expect to furnish the nations of western Europe over the next four years, a careful study had to be made of what the demands on U. S. food supplies are likely to be during that period. The conclusion is that we will need all the grain we can produce for several years. It now appears that it will be at least two years before wheat and corn acreages may even begin to come down to levels dictated by good soil conservation practices. It is extremely important, however, that the grain export goals for Europe be met, for a number of obvious reasons. If we can prevent further deterioration in the diets of western Europe this winter, it will greatly improve the prospects for the success of the European Recovery Program.

Many plans are laid for the future of the conservation program. Congress has provided funds until midyear for an intensified program, and the U.S.D.A. was given the responsibility of carrying it out. The writer was made acting director of an Office of Food and Feed Conservation which was set up in the Department. This office has three divisions: Consumer Division, Industry Division, and the Farm Division.

The latter ties in most closely with the operations of the pesticide industry. Since nearly three-fourths of the nation's annual grain crop is fed to livestock, it is on the farm that the greatest savings are expected to be achieved. The program of the farm division is now in full swing, with the cooperation of numerous groups including state colleges, farm organizations, Extension Service personnel, of industrial organizations, and of farmers themselves.

Actually, the grain conservation program represents nothing new in agriculture. Rather, it is an intensification of the educational work which the Department has been doing for years, directed today toward the specific goal of grain conservation. It is good sense, a good business approach toward farming; one that combines scientific knowledge with horse sense. Every modern means of communication is being used to help put the program across.

The farm conservation job is being approached from three directions. The first two involve efficiency of production and utilization. The third is in the direction of stopping waste. It is poor efficiency when 40 percent of our pigs farrowed never live to reach market age; when parasites sap the energy and reduce the gains of growing livestock at the rate of nearly a half-billion dollars a year; and when inferior yields are obtained from croplands which could yield abundantly if technical knowledge, now available, were put into use. The current program is dedicated to turn the tide against this type of inefficiency, and to make every kernel of grain and every pound of feed do the most good for farmers and for the nation.

Finally, we can never have a fully efficient agriculture as long as rats, insects, fire, and sheer carelessness continue to take their annual toll of grain with loss figures running into the millions of bushels. The insecticide and fungicide industries can continue to make a major contribution in helping to prevent much of this waste. They can also aid in increasing farm production.

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* Paper presented at A.I.F. Association meeting, Washington, D. C., February 19, 1948.

Heavy Toll from Pests

HOW much is our food supply reduced each year by the destruction of insects, rodents, and fungus diseases? It's hard to get precise figures. It has been estimated that the toll levied by plant diseases alone averages from 5 to 17 percent in many of our more important crops. Our specialists have estimated that in many crops insects destroy an average of around 10 percent during the growing season, and, in the case of grain stored on farms, another 5 percent or more is lost in storage. This stored grain destruction alone averages around 300 million bushels each year. Rats destroy or injure perhaps another 200 million bushels of grain. Though we don't contend that these figures on grain losses are precisely correct, they are the most carful estimates which the Department has been able to make on the basis of available data. If they err it is probably in the direction of conservationism.

Let's look for a moment at some of the new methods of pest control which government and industry together have developed during the war and since. The progress is tremendously impressive. In insecticides we have developed DDT and benzene hexachloride and a number of other products which are already producing—or hold promise of producing—results in the control of some pest far surpassing anything ever achieved before. We of the Department take particular pride in the aerosol method of applying insecticides which holds promise of revolutionizing that field. The development of new and powerful chemicals which can be used with a small amount of solvent has made possible the practical use of airplanes for applying liquid insecticides, as well as more effective methods of ground application.

In the field of fungus diseases we also have many improved weapons, such as the new organic fungicides. One of these fungicides has been used industry-wide by west coast pear producers since 1946 to control pear scab. During the first year of this campaign it is reported to have increased the production of one variety of pears by 300,000 boxes. An attempt is now being made to find something which will get similar results with apple and peach scab.

Great strides have also been made in the treatment of seed to control both seed-borne and soil-borne fungus diseases. The U.S.D.A. is now recommending annual seed treatment for wheat, barley, oats, corn, sorghum, rice, cotton, sugar beets, and certain vegetable crops. The full utilization of this practice could bring a great increase in production. The use of growth regulators in seed treatment also holds promise and the Department is currently conducting research in this field.

Herbicide Progress

POSSIBLY some of the most exciting developments in recent years have been in the field of herbicides, such as plant growth regulators like 2,4-D. Of course plant growth regulators are used for other purposes too, such as improving the rooting of hard-to-root cuttings, ripening starchy fruits, preventing sprout formation on potatoes in storage, preventing certain diseases in storage such as apple scald, and numerous other uses.

But in the three years since its introduction, 2,4-D has become a symbol of destruction for one of the farm's worst pests—weeds. And in gaining that new symbol we may be in process of losing an old one—the man with the hoe. Many persons who grew up on the farm, and spent innumerable tedious hours hoeing, will look with considerable pleasure upon the prospects of its passing. The man with the power duster on the forty-foot boom spray, whose future hours of labor in weed killing will be but a small fraction of the time spent in the old method, may soon become a common sight on American farms—signifying another dramatic step in the march of agricultural efficiency.

Research on the use of this herbicide is being carried out as rapidly as possible. Since more acres of our cultivated land go into corn than to any other crop, we are particularly interested in seeing how 2,4-D can best be used in corn production. Last year when the ground was so wet in our corn belt and the need for corn so urgent, we used this chemical on several thousand acres of corn, even though our scientists felt the need of doing further research. The work was successful and we feel sure that under wet conditions 2,4-D can be used safely and effectively on corn during a certain period of its growth. To say what it will do under dry conditions requires further experimentation.

Experiments which are still in the early stage indicate that it may be possible to apply 2,4-D to corn land before the corn comes up, so as to kill the weeds as they emerge but without injury to the corn. If this works out it might be possible to "lay by" corn before it has ever come up.

One point is to be stressed about all new insecticides, fungicides, and herbicides. The fact that U. S. manufacturers of pesticides are allowed to put new products on the market without pre-testing by government agencies places a tremendous responsibility on the industry. The industry must see to it that these materials are thoroughly tested before they are offered for sale. A great deal of improvement has been made in industry testing in the last decade, but some firms still have a long way to go.

Every wave of agricultural chemicals flowing to the market carries some products that give little or no control. Usually these inferior materials come from firms on the periphery of the industry. They do not have facilities for thorough testing and may be unaware of its importance. Reliable manufacturers suffer as a result of their competitors' negligence. The Department of Agriculture tests most new products after they are introduced — particularly those which involve fundamentally new compounds. By the end of the first season's tests evidence is generally at hand to show whether the chemical does what it is said to do. The ineffective materials are gradually weeded out and the sphere of usefulness of effective materials is defined. Hasty introduction and unwise claims cannot be prevented by the

U.S.D.A., however. Industry has the responsibility on this point.

Another problem closely related to the previous ones, is the need to see that new products which are effective for certain uses are not employed for other purposes for which they are not fitted. Sometimes this is due to the overenthusiasm of farmers themselves, but one wonders if it is not also sometimes due to the encouragement of overenthusiatic salesmen. Industry and the U.S.D.A., have a mutual responsibility here. The problem is intensified of course by the number of new and powerful preparations now on the market.

Fulfillment of these objectives involves a big and continuous education job carried forward by both industry and government. It also demands that our research work be accelerated as much as possible. Farmers are a very self-reliant group and are sometimes unwilling to wait until a new use of one of these pesticides is fully worked out. The experience of the Department in research on 2,4-D well illustrates this problem.

Sugarcane producers in the Louisiana bayou country until two years ago were experiencing great difficulty in controlling the amphibious alligator weed that came up out of the bayous and set root into their valuable sugarcane lands. No amount of plowing and grubbing would control the pest. In fact, cultivation made it worse as the scattered roots sent up new and smothering growth that was gradually taking more and more land out of sugarcane production.

It was decided by the Houma, Louisiana, sugarcane experiment station to try 2,4-D on the pest. Experimental plots were selected and the material was applied. They didn't realize that several hundred sugarcane growers were watching every step they took. From the very first application, it was apparent that 2,4-D did kill the alligator weed, but the experimenters were waiting to observe possible injury to the sugarcane. Next year, perhaps, they would be ready to tell Louisiana growers what to do to control alligator weed.

But after seeing the results with the weed, the Louisiana farmers didn't wait. They, too, immediately began applying 2,4-D. Fortunately, the sugarcane was not damaged and production was considerably increased.

Not all such examples of farmers jumping the gun turn out as well. They sometimes forget that 2,4-D is a double-edged sword. It kills broad-leafed plants, and it doesn't distinguish between good and bad ones. One outstanding incident occured last year when a group of rice growers, hired airplane dusting crews to treat their fields with 2,4-D, because wet fields would not permit use of ground equipment. Unfortunately, fields of cotton and sweetpotatoes, some as far as 15 miles away, were severely damaged by the drifting dust. This unfortunate incident has resulted in the introduction of a Congressional resolution calling for extreme caution in the application of 2,4-D.

Insecticide Cautions

SOME farmers are undoubtedly courting trouble by using new materials such as DDT and benzene hexachloride in ways not recommended. When DDT gets into the soil in sizable quantity it is injurious to some crops. Furthermore, it is not soluble in water and hence tends to linger in the soil. In spite of this fact, some farmers may feel that if a little application is good, a big application would be all the better, and may thus possibly hurt their land. Benzene hexachloride when improperly used may impart an off-flavor to some foods. Extreme care must be taken by the operator in the use of this particular insecticidal material, in order to avoid this possibility.

These are merely random illustrations which show the extreme caution needed in seeing that pesticides are used only for such purposes and in the manner recommended on the basis of thorough research. It is true that there is a need today to speed up pest control as much as possible, but wide publicity on a few bad mistakes can seriously retard the entire effort. The industry's research and marketing organizations can do a great deal to aid in this educational job.

Improved Equipment Needed

ANOTHER point which should be stressed is that machines for applying pesticides have not kept pace with the rapid development of new chemical preparations. It has often been necessary for farmers to devise homemade applicators or to adapt equipment devised for other purposes. Though our farmers are very ingenious, the results have not always been good. Haphazard applications and makeshift machines can't give maximum efficiency. Application must be made with precision and with equipment engineered for the purpose. Though manufacturers recognize this and have made marked contributions toward better equipment, it is recognized that much more needs to be done.

The ways in which the pesticide industry can continue to aid in getting maximum food and feed conservation may be summarized in the following five points:

1. Continue and expand research to give the farmer the best possible chemicals that American genius can devise.
2. Make sure that new products are thoroughly tested before they are put on the market.
3. Make them available to the farmer in such form and with such instructions that the material may be easily and safely applied.
4. Do all you can to see that machines which will produce maximum effectiveness from these materials are available for their application.
5. Continue to aid in the education of the farmer on the basic common-sense effectiveness of this program and the tools for pest control now at his disposal.

It is realized of course, that complete control of agricultural pests cannot be achieved over night. But for most of the worst pests there are now available to growers, simple, scientific methods of control if they will only use them. If we can increase the wise use of these pesticides, it will

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Minute Amounts of "Minor" Elements essential in addition to "Regular"

FERTILIZER

WELL known to present day agricultural scientists is the fact that green plants require for their growth minute amounts of certain chemical elements in addition to those regarded as comprising a complete list of essential elements for higher plants. This so-called classical list included only 10 elements: carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, potassium, calcium, magnesium, and iron.

Iron in the above list is required only in minute quantity, but its importance has long been known. The new additions to the list of essential elements, now generally accepted, include: boron, zinc, manganese, copper and molybdenum. Some investigators would not concede that it has been proved that *all* the elements just named are essential for the growth of *all* species of higher green plants, although boron and manganese probably would be considered generally as indispensable for all plants of this type. This is concluded from the evidence over a wide range of species of plants. The evidence is equally conclusive for the other elements of this group for some species of plants, but the number of species investigated adequately is limited. In fact, for no chemical element has it been proved by direct and critical experimentation that it is essential to the growth of every species of plant existing in nature. Nevertheless, we do not doubt that elements like nitrogen, phosphorus, and potassium, are required by all species of higher plants on the basis of experiments on a limited number of species. Most of the evidence concerning this aspect of the nutrition of plants, whether for elements required in large or minute quantity, comes mainly from studies on plants of agricultural interest.

When the statement is made that any element is essential, at least in minute amounts, for the growth of a plant, it is necesary to emphasize one qualification, namely, that the statement is relative to quantitative criteria. The positive evidence for essentiality is derived from experiments in which plants are grown in artificial nutrient solutions or in pure sand treated with these solutions. We conclude that an element is essential if the plant can not complete its life cycle when a particular element is omitted from the nutrient solution and all other known nutrient elements are present. The failure of the plant to grow normally in the solution from which an essential element is missing is compared with the normal growth of the plant in the solution containing the element.

Since the amounts of certain essential elements required are exceedingly small, the experiments have to be conducted under the most rigorous control. Redistilled water, purified nutrient salts (often the so-called C. P. chemicals are not pure enough), special culture vessels for growing the plants, and avoidance of dust contamination may be necessary precautions. Even with the best technique it is usually not possible to say that a culture medium is absolutely free from a particular chemical element. Therefore our final conclusion is limited to the statement that a plant will not grow with the amount of the element in question which may be present as an inevitable impurity, derived from the chemicals, the water, or the culture vessels, or from contamination in the surrounding air, despite all efforts at purification feasible at the time.

This difficulty of purifying experimental culture media explains why the need by plants for some of the chemical elements essential in minute quantity was not discovered by early investigators, who did not possess present knowledge of refining nutrient media.

Thus the evidence now available is that the elements boron, zinc, manganese, copper and molybdenum, must be supplied in greater amounts for the growth of the kinds of plants

by

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most carefully investigated than the amounts present in the culture medium when the highest degree of purification is effected to exclude the element under study. For example, to show by direct proof that copper is an essential element, the plants under test must grow normally when a minute amount of copper is added to the purified medium, while plants of the same kind fail to grow normally without the addition of copper, all other conditions being kept the same for all the plants. But the amount of copper required by some plants may be so small that there would be enough present in ordinary distilled water (derived from contamination of apparatus or storage tanks) and so the plants must be grown in specially redistilled water.

All this means that traces of an element still present as impurity in the control medium after every means of purification has been used might be essential for the plant, and we could not prove it until our procedure for purification of the nutrient medium became still more refined.

While these observations stress the significance of minute amounts of certain chemical elements for plant growth, nevertheless the term "trace" element may be in general inaccurate when referring to elements essential for plants in amounts which, though minute, are larger than the amounts which chemists usually refer to as traces. This is true of boron, manganese and zinc notably.

In further reference to terminology, attention should also be called to the point that the use of the term "minor" to refer to elements, is also misleading. If a plant fails completely to grow when no boron is present in the medium, as it may, then it seems inappropriate to call boron a minor element. How *much* of an element is required for plant growth does not determine its essential character. For these reasons some investigators refer to essential chemical elements needed in minute amount as "micro-nutrient" chemical elements.

The question may now occur to some readers; "Why, if only such minute amounts of some chemical elements are required by plants, do these elements have any practical interest for the agriculturist?" "Surely, enough of such elements would always be present in the soil."

The answer to this question has been decisively given during the past two decades and the answer involves considerations still not always fully understood. Despite the minute amounts of boron, manganese, zinc, copper, and molybdenum essential to plant growth, amounts which indeed may be present under laboratory conditions as impurities, difficult to remove from pure chemicals, all agriculturists interested in the soil as a medium for plant growth now are familiar with the fact that in a recent period thousands of special soil conditions have been observed in many countries and with many crops, which demonstrate conclusively that under the conditions studied a crop has responded to application of one or other of the micro-nutrient elements. Sometimes in the absence of the particular element, serious crop disease or crop failure has occurred. Most soil and crops do not show such deficiencies, but the cases in which they do are numerous enough to be marked with importance. It is again a case of experiments that seem at first to be of only academic scientific interest coming to having outstanding practical significance.

"Availability" the Key

THE obvious reconciliation between these observations from the field and the laboratory evidence that the chemical elements concerned are needed by the plant in only very minute amounts, lies in the concept of "availability" of nutrient elements in a soil. The deficient element will nearly always be present in the soil, but may not always be in a condition to be absorbed by the plant even in minute quantities. The plant is therefore more or less starved for the element. A striking illustration may be offered from the experience of the writer and his colleagues in California. In certain soils in which fruit trees were diseased because of deficiency of zinc in the plant, the soil in fact contained within the root zone enough *total* zinc for the requirements of the trees for centuries.

The reasons for lack of adequate availability of a micro-nutrient element in the soil would require a long article and often the reasons may be obscure. There are all the factors of chemical reactions in the soil (precipitation, base exchange and other colloidal reactions, influence of pH, etc.) and occasionally perhaps another type of reaction that is concerned with soil micro-organisms.

It may be that certain soil micro-organisms living on or adjacent to plant roots absorb some available micro-nutrient element in relatively low supply before it can be absorbed by the crop plant. In other words, a sort of biological competition exists for the element. There are various lines of evidence for this hypothesis, from work in Europe and California, but none of the evidence is of such a nature that it leads to conclusions beyond question.

Mention should be made here of hypotheses occasionally held, that certain diseases of plants apparently produced by lack of a micro-nutrient element, may be caused actually by organic toxic substances produced by micro-organisms capable of neutralization by some element. When this element is applied to the soil or plant it prevents or cures the apparently nutritional disease of the plant. The complex inter-relations of micro-

organisms, crop plants and micro-nutrient elements, have not been solved by any means. However, the present opinion in all major cases of plant disease corrected by application of a micro-nutrient element, indicates that nearly always the disease is actually caused by deficiency of the element concerned for the crop plant's nutrition. The possibility should be kept in mind, however, that micro-organisms may sometimes prevent the crop plant from absorbing enough of the deficient element. Of course, various diseases produced by micro-organisms may attack the nutritionally defective plant as secondary infection.

Returning now to the discussion of availability with reference to micro-nutrient elements, there is a practical point which the reader should note.

If the amounts of the micro-nutrient elements essential for crop growth are so small and if the soil sometimes can not supply enough of one or more of these elements, is it important that in ordinary fertilizers there should exist very slight amounts of the micro-nutrient elements as impurities? We shall not attempt to answer this sometimes controversial question, but wish to recall that in some soils (including most soils of the western part of the U. S) the very factors which made the deficient element insufficiently available to the crop may cause to be ineffective any small amounts added as impurity in a fertilizer.

It may be that the fixing power of the soil for some deficient micro-nutrient element may be so great that even an application of this element to the soil too large to be economical may fail to supply the crop with enough of the element to insure good nutrition of the plant. This may be an especially important consideration in treating fruit trees or other deep-rooted plants. Sometimes the remedy is to supply the deficient element to the plant directly, as by use of sprays. It is easy to see that minute amounts of impurities of micro-nutrient elements in commercial fertilizers may be without great significance for the nutrition of a plant. Naturally the validity of this conclusion will depend on the kind of soil, the kind of crop and the specific nutrient element deficiency. In general however, a survey of the literature of this subject leads to the impression that nearly always when a serious deficiency of supplying power of a soil for a micro-nutrient element exists, correction of the deficiency demands the application to the soil or the crop of much more of the deficient element than in the majority of cases would be contained as an impurity in common fertilizers or soil amendments. The useful effect of impurities of this nature in animal manure or commercial fertilizers over very long periods of time is generally a matter of assumption or speculation.

Excessive Use Unwise

THE other side of the picture should not be overlooked. The micro-nutrients so essential to crop growth can be toxic to the crop when the amounts absorbed are excessive. Too heavy an application of such elements must be avoided. Experience with excessive boron impurities in certain fertilizers used during the first World War is a case in point, as is also that of too high boron content in irrigation waters.

In discussions of micro-nutrient elements, a large number of chemical elements are often cited as essential to plant growth. If the criteria already presented are kept in mind, it must be noted that rigorous evidence has been presented only for boron, zinc, copper, manganese and molybdenum as additions to the older list, with some investigators doubting the general essentiality of even some of these elements. If the list of essential elements is extended beyond those named, it is done at present without adequate proof. It is entirely possible, however, that other elements may have to be added to the list later.

A distinction should be made between elements that are fundamentally essential for plant growth and elements that may be beneficial under some circumstances; for example, when the plant may be subject to the attack of certain injurious micro-organism. Yet in such cases, when the micro-organism is not present, the beneficial element might not be essential or even beneficial to the growth of the plant. There may be other special conditions that make a particular element beneficial for certain species of plants even though it is not an absolute general requirement for plant growth.

Another source of confusion in discussing elements essential to plant growth is the occasional implied assumption that elements essential to the plant and animal are identical in number and kind. But we do not know, for example, that boron is as essential for animals as it is for plants. The animal requires sodium, chlorine, iodine and cobalt, but the general essentialty of these elements for the plant has not been proved definitely thus far.

It is true that an animal may suffer from a deficiency of one of these elements because the crop which serves as food did not contain enough of it, yet the crop itself may have no essential need for the element. In making this statement the previous remarks should not be forgotten, concerning the extreme difficulty of obtaining conclusive evidence for the essentiality of an element like iodine for crop growth, because the element may be an almost omnipresent impurity in nutrient media, chemicals or the atmosphere. There are also well known cases in which the crop may absorb so much of an element (e.g. selenium or molybdenum) that the crop becomes toxic to animals.

Vitamin Content

WITH further reference to inter-relations between animal and plant nutrition, the claim is sometimes made that an increased supply of some micro-nutrient element to the plant will result in a larger content in the latter of one or another vitamin. Certain investigations have suggested as an illustration, that the content of vitamin C will be greater in the plant when manganese is supplied to the soil. But the results of different investigations on this point are contradictory. Some of the most careful and critical studies, such

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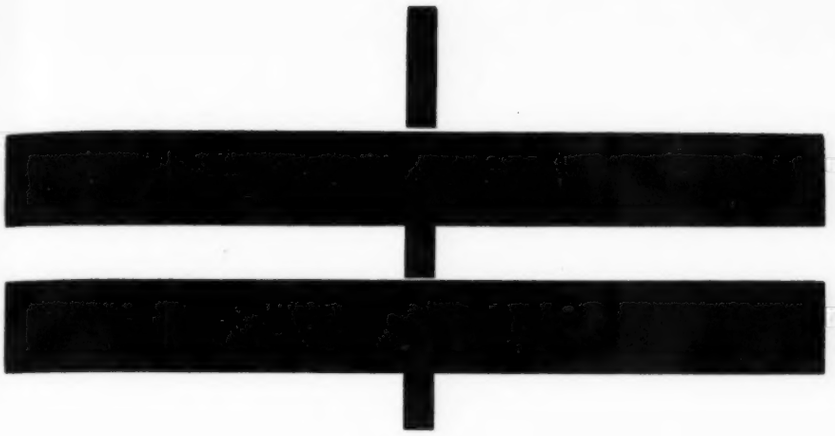

CHEMICAL WEED CONTROL

by

Dr. N. E. Van Stone*

**Vice President, Sherwin-Williams Co.
Cleveland, Ohio.**

THE roll call of the companies interested in agricultural chemicals will be recognized as including many of the top-flight organizations of this country — or of the world. Many of these companies owe their growth to the tremendous chemical strides in this country over the last thirty years. Products of these companies have become by-words in every industry and household throughout America because of the far-reaching effects of the chemical industry into homes, industries and the farms.

These same companies have certainly kept faith with the farmer and the nation in producing materials for the control of insects, pests and weeds that have threatened our food supplies, our health and our comfort. This list of companies includes those that produce every type of chemical used to bring up its present high level, our standard of living which is so far above all other nations of the earth, mainly because our industrial system has been the most efficient one through which to make such progress.

Over these years the insecticide industry and these companies have kept faith with the farmers, anticipating each year possible pest outbreaks in cotton, fruit, vegetables and other crops. The agricultural chemical industry has invested its money in plants and raw materials and produced the chemicals during the long winter months to be stored in various locations in anticipation of the probable infestations of the spring, summer or fall.

Even when such infestations have failed to materialize, or if at times supplies of important raw materials have been curtailed or lost completely, as many were during the war when certain imports were cut off, the American chemical insecticide industry saw to it that suitable substitutes were developed. Plants were built for the production of these substitutes and the distribution of satisfactory government-approved insecticides and fungicides went forward, preventing serious losses to the nation's crops.

Our industry has been called upon at times even to make airplane delivery of products to parts of the nation where unexpected and unusual pest infestations had broken out. Our record shows that we have been able to aid the farmer and crop grower to avoid serious losses from insects and plant diseases.

However, in this modern day no industry can be adjudged as fulfilling its duty merely by servicing the public at a profit. It is demanded of modern business that it extend its efforts in research and development of new and better products. We point to our record with pride, for certainly no other industry can point to any greater developments than can the insecticide industry in its recent, most successful, efforts in the insecticide, fungicide, and now more recently, the herbicide field. As a result of this research and development we are now able to talk about additional aid to the farmer by control of a pest which has been almost neglected and almost accepted as the inevitable in the raising of our food and feed supplies—the weed problem.

Heavy Losses to Pests

THE Department of Agriculture tells us that there is more than a two billion dollar loss to the nation annually on account of weeds. These four staggering preventable losses from insects, plant diseases, rats and weeds, add up to a total greater than the

* Paper presented at A.I.F. Association meeting, Washington, D. C., February 19, 1948.

"Lay down de shovel and de hoe!"

2,4-D revolutionizes weed control!

In this day and age, Uncle Ned of the folksong, wouldn't have had to go to his reward in order to "lay down de hoe"! For *chemical weed control* is now an accepted agricultural fact.

Widespread field tests in the past few years have proved that the application of 2,4-D (2,4-Dichlorophenoxyacetic acid) is highly effective for weed control in crops such as corn, wheat, oats, rye and barley, rice, and sugar cane. Not only has it been proved an effective weed control but it has also increased the vigor and yields of agricultural crops.

2,4-D is only one of a wide variety of agricultural chemicals, including insecticides, fungicides, germicides and rodenticides which are produced and marketed.

Your inquiries are invited! Please address them to

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(Organic Phosphate Insecticides)
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Phenol Disinfectants

amount suggested recently by the Senate Committee as our first-year contemplated expenditure for the Marshall Plan. This industry's products, properly applied in the field, could save a large part of this sum at a relatively low cost, percentage-wise, if everyone connected with the production, storage or handling of food could be made aware of the possible means of providing this saving. The above statement may be startling but the results of the new products now being produced by the members of the AIF association are equally startling or even more so.

The American chemical industry has developed into a huge organic chemical industry only in the last thirty years, and the agricultural chemical industry is fast becoming an important factor in the production of these new organic products. Within the last few years, new products have been developed which have revolutionized control of pests and weeds in the nation, and it is because of these revolutionary proven products that we dare to suggest that a tremendous increased saving of the food and feed crops of the nation is possible.

Probably no other industry has received as many favorable comments from the press and the public as our own because of development under war-time conditions of DDT and the attendant aid it gave our men in the field of war. Since that time, it has contributed to home and farm comfort. No other chemical ever became a household by-word so quickly. And the great contributions, both to the health and the food supply of the nation, have not yet been completely realized. This product, developed mainly for protecting man's health, bids fair this year to aid us in turning back the corn borer, cattle parasites, fruit insects, etc., that have been continually threatening our major crops.

Several other new organic products have also been tried out successfully for insect control in the fields of cotton and indicate possible complete control of the boll weevil and other insects that have from time to time threatened and destroyed large portions of this important crop. All of this does not include the figures on losses this nation suffers from rats and other infestations in grain storage—ticks, lice, flies and other insect pests. However, one of the latest and most interesting products of this industry is another war-time development—selective weed killers, products which act in a hormone-like manner and bring about most miraculous results. These may aid us this year in the conservation of food and feed.

Tractor with wide spray boom can cover many acres in short time. Weed killer material flows by gravity from tanks at side. (Sherwin-Williams Photo)

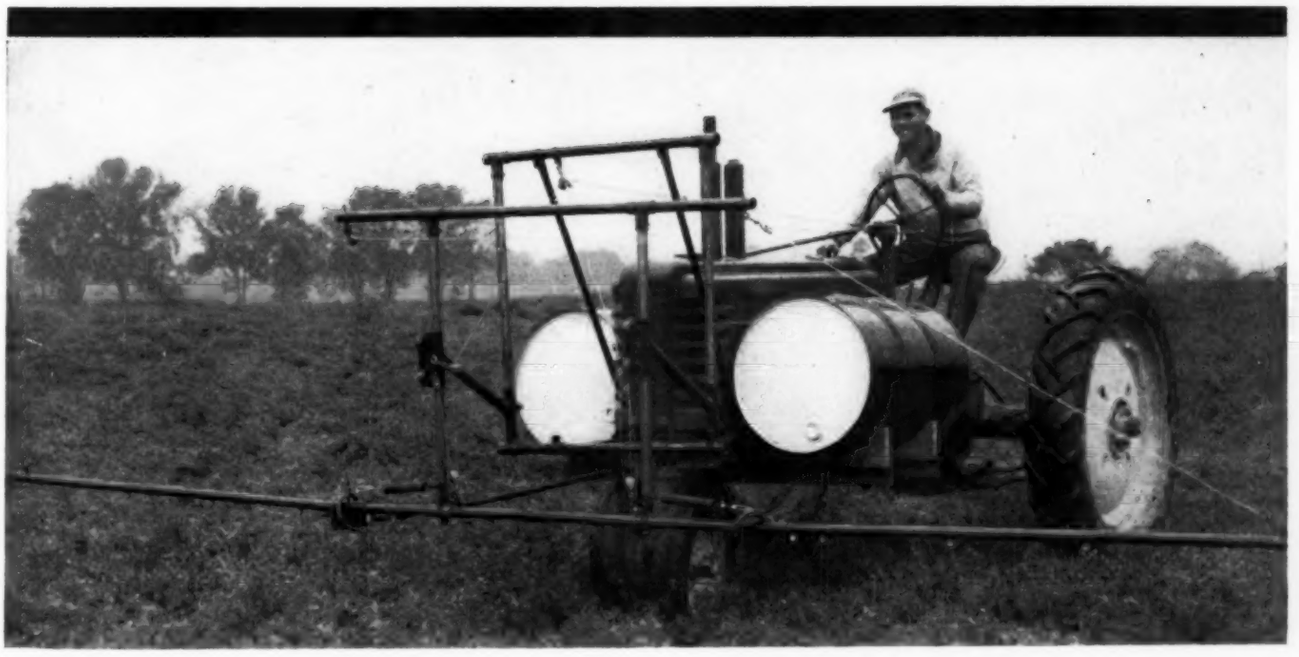
Great Interest in 2,4-D

THIS development has, from its very inception, been accorded great attention by the Department of Agriculture and by the experimental workers in the various land grant colleges across the nation, and as a result, because of the intensive work carried on by the industry and by our own laboratories in the field, a new means is now available for producing more food and feed than was ever before available to any nation.

A few weeks ago various individuals connected with the experimental work on weed control in the land grant colleges across the nation were asked to give us their opinion on what increases in food, grain, meat and milk supplies could be obtained by the proper use of 2,4-D. The returns from this requested information were so outstanding that it seems important to mention a few of them. These answers cover the area from Oregon to New Jersey—from Oklahoma to North Dakota.

Aggressive farmers in the field, aided by county agents and stimulated by peculiar local conditions as well as the desire for more grain and crops last year, really ran their field work ahead of the approvals of the experimental stations bringing about such interesting results that 2,4-D bids fair now to out-do DDT in prominence.

Here are some of the quota-



tions received from those replying to the question. All of them indicate the great possibilities of increasing food and feed supplies this year by use of 2,4-D.

FROM WISCONSIN — an extremely careful authority with high standing among similar experts in the field, wrote as follows: "I would guess, with some speculation, that the increase in grain production, which is mainly oats in Wisconsin, would be 1,340,000 bushels—on corn, the increase would be 1,013,000 bushels —hay 13,000 tons—and an increased production, by proper treatment of the pastures with 2,4-D to eradicate the weeds, might result in an increased milk production of as much as 71,000,000 pounds." These increases just mentioned cover Wisconsin alone.

IOWA STATE COLLEGE—State authorities report—"We are confident, with other things being equal, our over-all crop production in Iowa could be increased conservatively by 15%. We have ten million acres of pasture and meadows in Iowa, the carrying capacity of which could be increased by 25% by judicious spraying of 2,4-D to control the weeds." This is the area that last year learned about the miraculous ability of DDT to control the corn borer, and this increase or saving will be added to the saving mentioned above—15% possible over-all crop increase for the state."

OKLAHOMA AGRICULTURAL COLLEGE—an expert states that his group would expect improvement of some 20 to 25% in their grass pastures in Oklahoma with the proper use of 2,4-D.

OREGON STATE COLLEGE has been especially interested in this new chemical selective herbicide and its report reads as follows:

"The proper use of 2,4-D would give the following increases:

Grain—25 to 100% increase in yield amounting to 2 to 20 bushels of grain per acre.

Corn—200 to 300 pounds of green ear corn per acre.

Milk Production—400 to 600 pounds per acre.

Beef—Although, we have no figures on actual meat production, believe on a normal 2 animal unit per acre of pasture, the carrying capacity, where weeds are a problem, could be increased by one animal unit."

PURDUE UNIVERSITY estimates the annual loss from weeds in Indiana at $44,000,000. Weeds reduce crop yields and reduce the carrying capacity of pastures. Proper use of improved methods of weed control will, without doubt, make possible a reduction in loss from weeds in crops—oats, wheat and corn.

THE UNIVERSITY OF ILLINOIS reports in similar vein, stating that the staggering losses and the great possibilities of reducing these losses and increasing the food and feed supply may be accomplished by the proper use of this new chemical.

COLORADO AGRICULTURAL COLLEGE reports that barley infested with poverty weed, and properly treated with 2,4-D, last year showed increased yields from 67 to 77 bushels. On wheat that was infested with bindweed, the yield was increased from 20 and 25 bushels per acre to 40 and 50 bushels to the acre, or a 100% increase, due to the treatment where the bindweed infestation was severe.

A careful observer from RUTGERS UNIVERSITY has stated that he considers the use of 2,4-D for a selective weed killer on the farms one of the greatest agricultural developments since the discovery of Hybrid Seed Corn.

IN CANADA, in the great area from Winnepeg stretching West, 500,000 acres were treated last year and carefully watched by Dominion authorities. They estimated 1,500,000 additional bushels of wheat were made available through the use of 2,4-D. In 1948, they indicate that

(*Turn to Page* 79)

2,4-D has found excellent use on grassy spots. Here is an application rig mounted on a Jeep for fast and thorough job. (Photo courtesy Sherwin-Williams).

Problems faced in California on

CHEMICAL WEED CONTROL

by

Dr. C. B. Hutchison *
Vice-president, University of California,
Dean, College of Agriculture

THE history of weed research by the California Agricultural Experiment station dates back to 1930, at which time the project was organized in the Division of Botany, under the direction of Dr. W. W Robbins. This division and the California State Department of Agriculture have worked together closely from the beginning; a relationship which has been most happy and fruitful. The rapid strides made in solving many of California's weed problems may be attributed to this close relationship which has existed for many years between the two public agencies.

Three major projects by the State Department of Agriculture have been outstanding in the solution of weed problems. These projects are: the eradication of artichoke thistle from some 70,000 acres of range lands in Solano, Contra Costa, and Napa countries; the almost complete eradication of camelthorn, which had spread to thirteen California counties, infesting perhaps a thousand acres at its peak; and the successful prevention of the spread of a heavy infestation of the perennial Austrian field cress in Modoc County. Many other instances could be mentioned of significant services that have been rendered by the State Department of Agriculture and the County Agricultural Commissioners in reducing losses from weeds already extant and in the prevention of new weeds from entering the State.

Effective weed control in any area demands organized cooperative effort: cooperation of Federal, State, and County officials, property owners, irrigation districts, power companies, railroads, seed companies, and warehousemen. It calls for research for new and improved methods of control, the broadcasting of information, its application to the problem at hand, and the support and enforcement of regulatory measures.

Weed control is important to every community, and to practically every property owner in the community. It is also of concern to the State and County highway organizations, power and telephone companies, city park and street commissions etc. Every individual and every group concerned with vegetative growth, experiences the problem of practical control of weeds. Attention also must be given to the development and improvement of machinery and equipment used in the application of herbicides and in cultural control of weeds.

It is not easy to estimate the agricultural losses caused by weeds. The committee reporting on the efficacy and economic effects of plant quarantine in California, states that the growers of California expended in 1929-31 an annual sum of $18,620,000 for weed control. This, however, does not represent the total losses, direct and indirect, caused by weeds.

In farm management studies it has been found that the cultivation of crops costs about 16 per cent of the total value of the harvest; and that approximately one half of the cultivation is made necessary by the presence of weeds. In California, in 1939, there were 4,545,000 acres of field and garden crops valued at $218,000,000. The cost of cultivation made necessary by weeds, figuring on 8 per cent of the value of the crop was $17,440,000. Orchards and vineyards in 1939 produced crops valued at $154,793,000. We have no studies which will enable us to estimate costs of cultivation for weed control among trees and vines, but it is safe to say that the total annual weed tax due to necessity for cultivation in California is several million dollars. We have a total here of not less than 30 million dollars. These are 1939 figures; the weed toll today is considerably more.

It should be mentioned at this point that some fifty thousand acres of citrus groves in California now operate under a non-cultivation program; weed growth is held in check by oil sprays. More recently, olive growers have become interested in this method of orchard management.

There are, too, other losses brought about by weed infestations. among these are reduced crop yields, increased cost of preparing crop pro-

* From paper presented before Tenth Annual Western Weed Control Conference, Sacramento, Calif., February 2, 1948.

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ducts for consumption, and the losses due to insects and fungi which are harbored by weeds. It is doubtful that we have ever realized fully how serious weeds are as a natural breeding ground for insects and fungus pests which attack crop plants.

Grazing Land Affected

THE weeds of range lands in the western states have reduced seriously the grazing capacity of these areas. Some 25 millions of acres of California range lands are dominated by introduced annuals, most of which are inferior in feeding value to the native grasses which once flourished there. We need only to cite the hypericum known as Klamath Weed or St. John's wort which now infests more than a hundred thousand acres of grazing land in Humboldt County alone, and now has spread to a total of 26 counties. The California Agri cultural Experiment Station has been studying the control of Klamath Weed in three ways. First, with chemicals; second, with range management practices; and third, in cooperation with the United States Department of Agriculture, by means of biological control with three species of beetles introduced from Australia and France.

These figures represent only a part of the losses which weeds cause. Weeds must be recognized as being on a par with insects and fungus diseases as enemies of agricultural production. Success or failure of crop is often related to the absence or presence of weeds. There is a close correlation between proper and timely farm practice and operation, and the degree of weed infestation. When we have taught a grower effective weed control, we have at the same time taught him the necessity of using other scientific methods for better farming.

A number of years ago, the staff of the Division of Botany of the College of Agriculture, in cooperation with Walter S. Ball, Chief of the Bureau of Rodent and Weed Control and Seed Inspection of the California Department of Agriculture, published a circular on weed control which covered numerous phases of the problem. Although it became known as the "Robbins-Ball weed control bible," and 40,000 copies were distributed, it is now realized that such all-inclusive publications are not of maximum usefulness to the farmers. This has become particularly evident in view of the developments within the last seven years. Accordingly, a series of attractive and readable short circulars have been issued, each covering a specific phase of weed control.

As one looks over these circulars and similar ones from other Agricultural Colleges in the country, he is impressed with the great difference between them and the weed publications of some 15 or 20 years ago. Formerly, emphasis was laid on weed identification; there were botanical descriptions, but a noticeable lack of definite information on control.

This was due to the fact that no definite body of scientific knowledge had been developed on which to base control measures, In contrast, current weed publications emphasize control because research, in the meantime, has produced that knowledge; the authors now have something definite to put into print. We at the University of California College of Agriculture, are determined to make these publications for farmers of value to those for whom they are intended by basing our recommendations for control upon scientific facts.

Practical Method Needed

SHORTAGE of labor and its high cost, the increasing prices of most farm crops, and a rather rapid spread of weeds which occurred during the war period, created an urgent demand for improvements in practical weed control methods. Concentrated research, coupled with field demonstrations and cooperation with all agencies concerned, brought into use from 1940 to the present time more revolutionary changes and improvements in chemical methods of weed control than had taken place in all agricultural history prior to that period. Here are a few of the most important of these developments:

1. **Wide application of selective herbicides to control weeds in fields of small cereals, including rice, corn, milo, and flax, and in peas, alfalfa, onions, carrots, and celery.**
2. **The discovery of growth-regulating substances as weed killers, chiefly 2,4-D and its substitutes.**
3. **The use of dinitro compounds as general contact herbicides, especially as fortifiers of oil.**
4. **Development of more effective soil sterilization methods available for ditchbanks, roadsides, fence lines, playgrounds, walks, and driveways and about buildings, signboards, and telephone and telegraph poles.**
5. **Marked progress in the knowledge of carbon disulfide as a soil sterilant, particularly the various field factors which influence its effectiveness.**
6. **General improvement in weed control machinery and equipment, including nozzle tops, pressures, and volumes. Here we must not overlook the use of the airplane in applying herbicides.**

The farmers of California want an expanded weed research program, because more facts are needed on which to base control measures. Eradication of any particular weed may apply to many agricultural situations. For example, the wild morning glory is a serious pest in almost every California crop. The time has come when nearly every primary weed requires the same concentrated study given to the investigation of a specific insect pest, or that one would give to studying a specific fungus. The development of effective and practical weed control methods requires men trained in plant physiology, plant morphology, soils, chemistry, and agricultural engineering. Fundamental research as required of investigators in any other field of agriculture, is needed. The phenomenal progress in weed control in the last few years has been the result of research. Further progress will come only from additional knowledge which in turn can come only from additional research.

The College of Agriculture expects to continue such research for through it further important contributions may be made. We have only to recall the saving of the government contracted carrot and onion crops by means of selective sprays during the war and the latest contribution, preemergence sprays for row crops, as examples in a long list of accomplishments to be assured of the importance of continued research.★★

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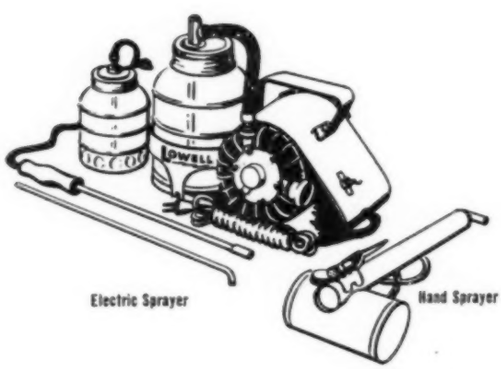

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The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

Plant Disease Progress Report

LATE BLIGHT. Potatoes in the Everglades region and in the Homestead area on the lower East Coast of Florida were being harvested at the middle of February. In the Homestead area potato late blight was controlled effectively by the use of "Dithane"-zinc sulfate-lime in a rigid spraying schedule. In experimental test plots, only this material and "Parzate" were effective; all copper materials, including copper-zinc chromate, failed. Tomatoes in the Homestead region suffered serious loss from blight, but some of the better farmers kept it controlled even though surrounded by blighted fields. Two applications per week of "Dithane"-zinc sulfate-lime were necessary. All along the East Coast from Fort Lauderdale to Fort Pierce and inland throughout the Indiantown area, tomato late blight was very active. The recent freezes did not seem to check it. Buyers avoided purchasing fruit from fields containing much blight. In northeastern East Coast areas late blight was active on potatoes around Stuart, and occurred at Sanford on seedlings in early tomato plant beds protected from the frost of January 14; younger tomato plantings at Sanford were still free at the middle of February, however. Both potatoes and tomatoes on the West Coast were affected at the end of December or beginning of January. The generally followed spray program had kept the disease controlled in potato fields of the Fort Myers area. The fall tomato crop in the Bradenton-Ruskin area was late but frost eliminated carry-over infection from this source as a danger to the spring crop. However, late blight appeared in tomato seed beds in the area by February 12, but was kept under control with "Dithane." In central Florida, the disease was present on potatoes in the vicinity of Leesburg, with abundant sporulation, prior to the killing frost at the middle of January.

Blue Mold was reported from a new tobacco bed in Cook County, Georgia, February 6. Several applications of 15 percent "Fermate" checked the disease successfully. Several other affected beds, both new and old, were observed in Cook County February 13. There were only four clear days at Tifton from January 16 to February 14. It was during this period of cloudy weather that initial blue mold infections occurred. Blue mold was active throughout the winter on *Nicotiana repanda* in the Lower Rio Grande Valley of Texas.

Downy Mildew has been reported on squash and cucumbers around Stuart on the upper East Coast of Florida.

Upper Miss. Valley Outlook

THE relatively new disease of oats, Helminthosporium blight caused by the fungus *Helminthosporium victoriae*, has been very destructive for the past three years in Indiana, Illinois, and Iowa, while other states of the Upper Mississippi Valley region have experienced its ravages to a lesser extent.

It was felt that serious losses

Report of Seven States Regarding the Helminthosporium Blight of Oats

State	Blight damage 1947	Supply of mercury fungicide for 1948	Estimated percent seed oats to be treated 1948	Estimated oat acreage 1948	Total bushels seed required to plant 1948 acreage	Bushels resistant varieties produced 1947	Estimated bushels resistant seed needed 1948
Illinois	Heavy	Adequate	75	3,374,000	10,122,000	—	excess
Indiana	Heavy	Adequate	—	1,300,000	3,900,000	2,500,000+ uncertified	excess
Iowa	Heavy	Adequate	50	5,500,000	16,500,000	18,000,000	excess
Nebraska	Moderate	Adequate	30-50	2,300,000	6,900,000	15,000	6,885,000
Wisconsin	Light	Adequate	—	2,700,000	8,100,000	200,000	7,900,000
Kansas	Moderate	Adequate	30	1,500,000	4,500,000	2,000	5,998,000
North Dakota	Light	Adequate	—	2,200,000	6,600,000	—	5,950,000

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in 1948 might be averted if accurate information were available on which to base control activities. For example, it is likely that much of the damage of 1947 might have been avoided if all of the states had been supplied with the mercury fungicides adequately for use in seed treatment. In addition, it was suggested that plant pathologists in the region should know which states would have surpluses of seed of resistant oat varieties.

Hence, a survey was conducted by J. R. Wallin in which the following factors were considered for each state: (1) severity of the blight in 1947; (2) the supply of mercury fungicide available for 1948; (3) the estimated acreage of oats for 1948; (4) the percentage of seed oats to be treated in 1948; (5) the bushels of Clinton or other blight-resistant varieties of oats produced in 1947.

The table compiled was from the replies from plant pathologists in seven of the ten states included, representing the best estimates available to them at the time the survey was made. The total bushels of seed required to plant the 1948 acreage of oats was calculated from the estimated acreage for 1948. The amount of seed resistant varieties that each state will need in 1948, as reported in the last column of the table was estimated by subtracting the bushels of Clinton or other resistant varieties produced in the state from the total bushels of seed required to plant the 1948 acreage.

The data indicate that in 1947, blight damage was greatest in Iowa, Illinois, and Indiana, while only moderate damage was reported from the Great Plains States of Nebraska and Kansas. In the northern states of North Dakota and Wisconsin, Helminthosporium blight was relatively unimportant.

According to the reports, as shown in the table, only Illinois, Indiana and Iowa have sufficient resistant seed material for 1948 requirements. Barring some unforeseen event, Helminthosporium blight should not be epidemic in those states this year. However, the disease will be a potential threat in Nebraska, Kansas, Wisconsin, and North Dakota, where supplies of resistant seed are inadequate. These states will partially overcome their deficit by importing resistant seed stock from the states with surpluses.

None of the states of the Upper Mississippi Valley region reported any scarcity of seed treatment materials. Therefore, lack of fungicides should not be the cause of an outbreak of Helminthosporium blight on oat seedlings this spring. The intensity of seedling blight will be determined by the percentage of seed oats actually treated this spring; in turn, the precentage of seed oats treated will be influenced by the effectiveness of the local seed treatment campaigns.

Insect Conditions as New Growing Season Begins

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

AS the crop season of 1948 approaches it may be of interest to review briefly the status of a few of the more important crop pests during 1947 and, where possible, indicate what may be in prospect for this year.

Weather during the spring and summer of 1947 was unfavorable for grasshoppers in many parts of the infested territory. However, conditions in late summer and fall became very favorable to grasshoppers, allowing rapid development and a long period for oviposition. Early season crop damage was light in the Great Plains States owing to the wet weather which stimulated growth of marginal vegetation and small grains while prolonging development of grasshopper infestations. Late damage was concentrated primarily on alfalfa, corn, fall planted grains, and sorghums. Grasshopper populations in 1947 were slightly heavier than expected in eastern and north central Montana, northwestern Nevada, southwestern South Dakota, and eastern and north central Wyoming. Noticeable decreases occurred in infestations in areas of southern Arizona, central California, central Minnesota, eastern Missouri, southern Oklahoma, eastern South Dakota, central Utah, and eastern Washington. Principal areas in which threatening or severe grasshopper infestations are indicated for 1948, as determined by surveys in the fall of 1947 are located as follows: eastern and north central Colorado, western Kansas, eastern, north central, and southern Montana, western Nebraska, south central and southwestern South Dakota, east central Texas, and eastern and north central Wyoming. Smaller isolated infestations are also indicated in southern Arizona, central and southern California, southeastern and western Idaho, northwestern Michigan, southeastern Minnesota, northwestern Nevada, northeastern New Mexico, northwestern North Dakota, the Panhandle of Oklahoma, southeastern Oregon, and central and northern Utah.

Mormon cricket infestations developed in 1947 about as indicated by surveys conducted the previous year. The infested acreage was almost double that of 1946; however, in most instances the infestations were fairly well removed from croplands and required control measures no more extensive than those employed in 1946. The 1947 survey indicates that moderate or heavy infestations may be expected this year in several areas of Idaho, Nevada, Oregon, and

Washington, the total acreage being slightly less than that indicated for 1947.

The velvetbean caterpillar was a much less serious pest in 1947 than during the previous season. Injury was largely limited to spotty infestations on peanuts and soybeans in southeastern Alabama, southwestern Georgia and northern Florida, and to soybeans in southern Louisiana.

In 1947 a total of 94 new counties in 11 States were reported infested by the European corn borer. All but 6 of the new county infestations were found west of the Mississippi River. This insect is now known to infest corn in 1,052 counties in 28 States. Estimates now available indicate that the European corn borer caused a loss of nearly $97,000,000 in the United States in 1947 to a corn crop valued at about $3,313,000,000. About $93,500,000 of the total loss occurred in corn grown for grain, the remainder being in sweet corn.

Jap Beetle Expansion

THE Japanese beetle spread considerably in 1947 up the valleys of the Connecticut, Hudson, and Delaware rivers. The area over which this insect is generally distributed was estimated to have increased about 3,250 square miles over the area of general distribution in 1946. The beetles were considerably more abundant in most of the generally infested area in 1947 than in any recent year. Summer rainfall was again favorable in most parts of the area and beetles may be expected to be unusually abundant in 1948 unless biological agencies such as milky disease, or adverse weather conditions reduce the grub population now in the soil.

Damage by the codling moth continued at an extremely low level in 1947 in all sections of the country where DDT was properly applied in adequate spray programs. In most areas there was renewed evidence of the ability of this insect to cause serious damage when less effective materials were used, applications were omitted, or spraying was poorly done.

Orchard mites, although held in check by the spray programs used by many growers, again were present in sufficient numbers in 1947 to cause or threaten serious damage in apple orchards in all important fruit areas. The European red mite occurred throughout the country, the Pacific mite caused serious injury in many orchards in the Far West and Pacific Northwest, and the two-spotted spider mite occurred commonly in all orchard areas from Colorado east to the Atlantic Ocean.

The Mexican bean beetle caused moderate to heavy damage at various times during 1947 in a number of states from Maine to Florida and westward to Colorado and Wyoming. This insect was recorded form Wisconsin for the first time in 1947, being taken near Madison late in August. An apparently isolated infestation was also found by State authorities at Blaine in Aroostook County, Maine, in September.

Pea aphid infestations and damage in 1947 were moderate to heavy in untreated pea fields on the Eastern Shore of Maryland and Virginia and in parts of New Jersey and Delaware. Sufficient pea aphid populations to require insecticide applications occurred in widely separated parts of the country including Maine, South Carolina, Alabama, Mississippi, Illinois, Tennessee, northern Utah, southern Idaho, the Palouse district of Idaho-Washington, in the Yakima Valley of Washington and in the Antelope and Imperial Valleys of California.

Moderate to heavy infestations of cabbage caterpillars, consisting principally of the imported cabbageworm, the cabbage looper and larvae of the diamondback moth occurred on cabbage and related crops at various times during 1947 in widely separated parts of the country, including the southern states, New York, New Jersey, Maryland, Tennessee, Ohio, Wisconsin, Minnesota, Utah, Idaho, Washington, California, Arizona, and Texas. The southern cabbageworm was present in unusual abundance on cruciferous crops in Georgia, Arizona and California. Light to moderate infestations of the cross-striped cabbageworm occurred in South and North Carolina.

A repetition of the unprecedented 1946 outbreak of aphids on tobacco occurred also in 1947. The green peach aphid, although often associated with foxglove aphid, potato aphid and possibly other species, was especially concerned. Injury to tobacco from aphids was recorded in practically the entire tobacco-growing areas extending from Florida to Massachusetts, westward to Tennessee and Kentucky, and northward to Wisconsin and the Province of Ontario, Canada.

Space will not permit a more complete review here of the insect conditions occurring during 1947. Further details on the pests mentioned above, as well as numerous others, may be found in the annual summary of the more important insects in 1947 issued by the Bureau of Entomology and Plant Quarantine.

Let's take a look now at the status, during the past few weeks, of some of the truck crop pests in the warmer parts of the country.

Truck Crop Pests

SERPENTINE leaf miner was fairly abundant and causing damage to potato, tomato, and squash in Florida during late February and early March and also damaged beans in Dade Couty and the Bradenton district in the first half of March. A light infestation of this insect was present on tomato in the Imperial Valley of California toward the middle of March.

The bean leaf roller was serious on beans in Dade County, Florida in early March. Cabbage caterpillar populations were generally scarce during February and the first half of March in all southern states from which reports were received. Toward mid-March occasional fields of cabbage in southern Georgia were moderately infested with larvae of the diamondback moth.

The vegetable weevil caused moderate to severe injury to cabbage and related crops in Georgia, Florida, and Louisiana during the last half of February. Infestations were lighter in South Carolina and appeared to de-

(*Turn to Page* 77)

Problems involved in the

Naming of Fungicides

By

Dwight Powell *

University of Illinois

DURING the past few years a number of organic compounds have been placed on the market as fungicides. As the number of such materials increased, it was evident that considerable confusion in designation was developing among both scientists and laymen. At the present time, these fungicides are specified by chemical names, one or more brand names, or by numbers. Much discussion has been brought about recently in many of the more popular scientific magazines concerning this problem with each contributor suggesting the need for alleviating such confusion by the selection and establishment of trivial names. Such names would necessarily be preempted from commercial trade-marking and they would be used concurrently by the scientists, laymen and manufacturers as a substitute for chemical, brand, and coded designations.

Plant pathologists have felt the responsibility of at least mitigating this confusion as far as the agricultural fungicides are concerned. The official organization of this group is the American Phytopathological Society and in 1947 a sub-committee was appointed to study fungicide nomenclature. The following men were selected to function on this committee, namely: Mr. S. L. Hopperstead, Goodrich Rubber Company; Dr. W. H. Tisdale, E. I. du Pont de Nemours & Co.; Dr. J. D. Moore, University of Wisconsin; and Dr. J. D. Wilson, Ohio Agricultural Experiment Station, Wooster, Ohio. (In 1948 the same members have been retained with two additions: Dr. J. C. Dunnegan, U.S.D.A. Plant Industry Station, Beltsville, Maryland and Dr. Eric Sharvelle, Purdue University, Lafayette, Indiana. (Drs. James Horsfall and S. E. A. McCallan will serve in an ex-officio capacity).

Realizing the extensive scope of this whole problem, this committee has decided to confine itself mainly to the selection of trivial names. All compounds well established in the agricultural industry will be considered for name selection with preference given to certain groups where perplexity is most likely to exist such as the dithiocarbamates, quinones, etc. All new materials will be named as they manifest merit in the trade.

Methods Selected

MANY suggestions have been offered by interested persons regarding the proper method of selecting common names. Four different concepts exist, as follows: (1) to select a name at random without regard to chemical structure or group; (2) to observe a system of chemical nomenclature having a name informative of chemical relationship but not a name denoting chemical significance; (3) to use a binomial system with the genus indicating a general chemical group and a species identifying the particular compound. Neither the so-called genus or species name should exhibit chemical significance. (4) to use index numbers for general groups and a specific name for a particular compound.

This committee at the present time is inclined to favor the first procedure of random name selection. This automatically provides a binomial system inasmuch as the neutral name will usually precede the brand name if specific identification is necessary. For example, the entomologists have accepted "chlordane" as the neutral, trival or common name of 1,2,4,5,6,7,8,8-Octachloro-4,7-methano-3a,4,7,7a-tetrahydroindane. This name denotes a particular compound but there are two different products on the market. Thus, to be more specific, one would need to refer to chlordane "Velsicol 1068" or chlordane "Octaklor" depending on which material was concerned.

It does not follow that random name selection is the best course of procedure. The other suggestions each have considerable merit but to become effective, definite rules and regulations will have to be adopted to allow either of them to become useable. Any system of naming needs a set of rules to guide it . To realize this, one should read Edward T. Schenk and John H. McMaster "Procedure in Taxonomy," 1935, which includes a reprint of the International Rules of Zoological Nomenclature with summaries of opinions rendered up to 1935. By reading this reference one will become aware of the work ahead if a definite plan of fungicide nomenclature is intended to be followed.

If such a system could be formed, it could very well apply to fungicides, insecticides, herbicides and nematocides. This would mean the cooperation of plant pathologists, entomologists, agronomists and

(*Turn to Page 73*)

* Chairman, sub-committee on Fungicide Nomenclature, American Phytopathological Society.

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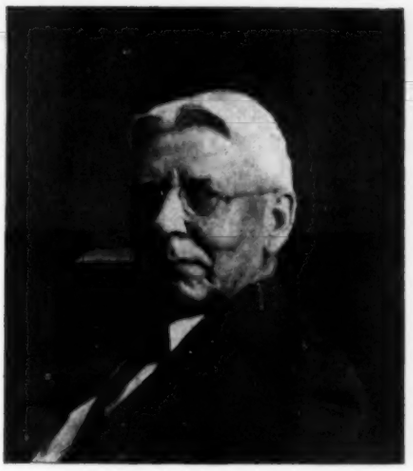

By Dr. Alvin J. Cox

This column by Dr. Cox appears as a regular feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief, Bureau of Chemistry, California State Dept. Agriculture in 1932, retiring in 1945.

THE Northwest Truck Crop Insect Conference was held in Portland, Oregon, January 19 and 20, with about 200 persons present. Officers elected for 1948 included Dr. G. F. Knowlton, Utah State Agricultural Experiment Station, Logan, Utah, chairman; Dr. W. C. Cook, U.S.D.A., B.E.P.Q., Walla Walla, Washington, vice-chairman; and David Brannon, Washington State College, Pullman, Washington, secretary-treasurer.

In charge of the conference were the 1947 officers: Dr. J. C. Chamberlin, U.S.D.A., Forest Grove, Oregon, chairman; Dr. M. C. Manis, University of Idaho, Moscow, Ida., co-chairman; and Dr. Brannon, secretary.

Topics discussed at the meeting included the control of pea insects; potato insects; wireworms, white grubs, symphylids and nematodes; cole crops; sugar beets, table beets, tomatoes, beans, lentils, asparagus and hops; cane fruits, strawberries, currants and gooseberries. These subjects were discussed by W. C. Cook, U.S.D.A., Walla Walla, Wash.; S. E. Crumb Jr. Oregon State College, Corvallis; M. C. Lane, U.S.D.A., Walla Walla, Wash.; and J. R. Douglass, U.S.D.A.

Although many pertinent reports were made, some of the subjects stood out as highlights of the conference. Some of these were as follows:

Equipment is always a problem for control of pea aphid as for other insect pests. Application of spray by airplane or dust by ground equipment gave best results but with indications that great improvement along these lines can be achieved. Airplane dusting for pea aphid control does not seem too hopeful at present. Smoke or fog generating as developed thus far has not proved satisfactory while gas propelled aerosols have not received sufficient testing. Dusts containing four to five per cent DDT and fifty percent or more sulfur or one percent oil afforded the most effective treatment against pea aphids. With ground machines now available the required rate is 35 to 45 pounds of dust per acre for good control. With better dusters, this amount may probably be reduced. Two percent oil was said by one investigator to improve effectiveness of the dust, but makes it heavy and difficult to apply. A higher percentage of oil in dusts was not tried. Available equipment does not furnish sufficient air volume to handle heavy dusts.

Oil sprays containing four to five percent DDT applied at rates of five to seven gallons per acre afforded good control. DDT spray applied with regular ground equipment, vapo sprayer, or airplane gave results comparable to those secured with good ground dusting equipment in the Pacific Northwest. This spray caused little or no injury to healthy plants but where virus mosaic injury was present it was accentuated by the use of the treatment. In California spraying has not been developed for use on peas.

In dusts DDD was almost as effective as DDT, and worthy of further testing because of its lower toxicity to warm blooded animals. Addition of certain adjuvants may permit reduction of the percentage of DDT. HETP in dust mixtures gave good immediate results but the lack of residual effectiveness made it inferior. BHC (2% gamma) dust at 24 pounds per acre gave a bad odor and flavor to peas both in pods and following processing. Chlordane and chlorinated camphene were generally inferior to DDT.

The last year has been outstanding in pea weevil control. The whole Salinas, California, area was dusted and the loss which was formerly 20% was practically eliminated. Infestation must be kept low for frozen pack peas. Vines dusted with DDT or other material that may leave a toxic residue should not be fed to dairy cattle. Sprays against peamoth and sitona weevil were discussed. These insects were controlled by the use of a five percent DDT dust.

Studies of the ecology of the pea aphid in the Blue Mountain area have shown that the insect hibernates chiefly in the block of alfalfa west of Walla Walla where damage is often caused to the alfalfa. Work in that area has shown that early spring burning of the alfalfa fields with a

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blast burner not only kills nearly all of the aphids present, but also helps to control annual brome or cheat grass, which is often a problem in reducing the quality of the first cutting.

Leaf Roll

THE greatest potato problem at present is in the leaf roll and its insect vectors. Potato psyllid is no longer a problem. Better control of insects in the last two years has largely failed to reduce incidence of disease. Production of seed potatoes in Oregon amounts to two million dollars annually. In 1947 ten and nine-tenths percent of all areas offered were rejected for pests. Forty-three percent of these were due to leaf roll; another forty percent was withdrawn chiefly because of the presence of leaf roll. One percent of leaf roll is allowed in the last inspection and it is useless to offer anything over that amount.

Only the aphid has been incriminated in transmission of virus disease, the green peach aphid probably being the chief offender. Overwintering is believed to occur in the adult stage in some places and in the egg stage in others. So far, in Oregon, the overwintering host of the green peach aphid has not been found. Green houses and home gardens are suspected. Potato breeding experiments are being carried on in Washington to develop strains resistant to virus diseases.

The potato aphid occurs on the top growth and is easy to contact but the green peach aphid is found more commonly on the lower leaves which makes the effective application of insecticides more difficult. Application of dust by means of ground equipment is superior to dusting by airplane, but airplane spraying is superior to ground spraying. Biplanes are superior to "Cubs" or other small monoplanes for spraying potatoes.

A four to five percent DDT dust made by fusing DDT with sulfur is excellent for control of aphids on potatoes. It is still better with one percent petroleum oil. The evidence indicates that heavy treatment of the soil with DDT reduced the yield. The green peach aphid was controlled by BHC dust at a total rate of 0.36 pound per acre per season, but all the tubers had an undesirable flavor. Larger quantities appeared to reduce the yield. If more than one pound of gamma isomer BHC is used on the soil, the land should not be used for potatoes the following year. HETP gave good immediate control but had no residual effect. Parathion, chlordane and chlorinated camphene were fairly effective (one aphid per twenty-five leaves). Controls have been obtained down to one aphid on three hundred leaves and wide spread leaf roll was still present.

Wireworms

IN control of the wireworm residual effect is what is needed. Ten pounds per acre is all that is necessary to apply not oftener than once in five years. At this dosage it has continued to afford an effective kill of wireworms if a whole season is allowed for effect. It will not protect a crop planted immediately after treatment, so non-susceptible crops should be planted the first season. It has good residual properties, killing new brood wireworms for several seasons after the initial application. However, under certain conditions high concentration has caused some damage to plants and it is not being recommended at present for use in soil until more is known about its effect on plants and soil bacteria.

BHC has shown excellent control of wireworms on silt loam irrigated soils of the Pacific Northwest. Dosages one-quarter to one-half pound of the gamma isomer per acre have given excellent kills in less than six weeks. These low doses gave only very slight off-flavor to root crops. The residual effects have not been tested longer than six months, but appear to be much less than DDT. BHC is not being recommended at present for use in soil, because of the off-flavor possibility and insufficient knowledge concerning other possible effects on soil fauna.

Chlordane 5 percent and chlorinated camphene 5 percent are about the same in toxicity toward wireworms as a 5 percent DDT dust; they are slow in effectiveness but have good residual properties. A field on which "Dowfume 40" was used at ten gallons per acre was planted satisfactorily in five days, at summer temperatures.

Use of ethylene dibromide as a fumigant, at a rate of ten gallons of a twenty percent by volume solution per acre, affords a method of killing wireworm that is nearly 100 percent effective if used under average conditions. For the best results the material should be placed at least eight inches deep in furrows 12 inches apart, or on the bottom of the plow furrow at the time of plowing. The cost of the material alone is $22.50 per acre in the Pacific Northwest with $1.00 to $5.00 per acre for applying according to the method used.

Symphylids were significantly reduced after the second year of rotary tillage on river bottom and heavy clay soil, where the distribution occurs. While more expensive than conventional tillage, rotary methods have increased dry bean yields twenty-five to thirty percent.

In several soil injection treatments in late summer with materials such as: "D-D," ethylene dibromide and BHC solutions, numbers of symphylids have been sufficiently reduced to pay dividends in increased yields in pole beans. The results of spring applications of these have been questionable. Where injury occurred, the plants outgrew the injury and the sparse foliage pleased the pickers. Excellent control has been obtained with BHC in dry form and rotary tilled into soil, but more work has to be done to prove its fitness in regular practice. BHC is believed effective in control of *Diabrotica* larvae and collembola.

Cole Crops Etc.

THE most important insect pests of cruciferous crops in the Pacific Northwest are the cabbage maggot, the cabbage aphid and the cabbage seed pod weevil. Tests conducted at experimental stations in Mount Vernon and Puyallup in Washington, and elsewhere seem to indicate that various formulations of BHC are the most promising of the materials tested for the control of these pests.

(*Continued on Page 70*)

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Suppliers' Bulletins

"Toxaphene" Brochure

Hercules Powder Co., Wilmington, Del., has published a brochure, "More Cotton Profit with Toxaphene," reporting tests made on cotton farms in various southern states. Complete data are given regarding profits from treated and untreated areas, with information concerning the number of applications, pounds used per acre, and the yield per acre. The booklet is available from the company, Wilmington, Del.

•

DDT Formulation Data

Dr. R. D. Chisholm, division of insecticide investigations, is the author of U.S.D.A. Bulletin #E-742, a complete review of DDT formulations. The paper reviews some of the formulation problems on the basis of general classifications and presents examples of formulas which have been used successfully to control various species of insects.

Three grades of DDT are discussed: technical, purified (or aerosol grade) and pure. The discussion covers DDT formulations as water-dispersible powders, dust mixtures, solutions, emulsions, and aerosols. A section on compatibility of DDT is presented, and a table of composition and sources of proprietary materials used in DDT formulations is given.

•

Air Compressor Bulletin

Ingersoll-Rand Company has published a new bulletin picturing a wide variety of air and gas compressors to serve in the chemical, process, and petroleum industries. Thirty installation pictures are included in the book, form 3132, "Process Compressors." It is available from the company, 11 Broadway, New York 4, N. Y.

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Adhesives Brochure

Minnesota Mining & Manufacturing Co., St. Paul, Minn. offers a 28-page brochure entitled "3M Adhesives in Industry." It contains some 40 pictures, cites 18 case histories, and lists many of the formulae offered by the firm's adhesives and coatings division. The address is 901 Fauquier Ave., St. Paul 6.

•

Technical Catalog Ready

Chemical Publishing Co., Inc., Brooklyn, N. Y. has issued a new catalog of technical books covering such subjects as chemistry, petroleum, physics, science, etc. It is available by writing the publishing company, 26 Court Street, Brooklyn 2, N. Y.

•

"Dowfume W-40" Booklet

Dow Chemical Co., Midland, Mich., has recently published a new booklet on its product "Dowfume W-40" for control of soil pests. The booklet includes information on control of wireworms, nematodes, Japanese beetle larvae, white fringed beetle larvae, other white grubs, maggots, and earthworms. Space is also devoted to picturing late models of application machines as well as dosage suggestions for soil pests on various crops. The booklet is available by writing to the company at Midland, Mich.

H. D. Hudson Co., Chicago, Ill., has recently placed on the market a new hand sprayer for the application of 2,4-D, as shown below. Information may be secured from the home office, 589 E. Illinois St., Chicago.

•

Miller Price Lists Out

Miller Chemical Co., Inc., Omaha, has recently published its DDT and chlordane wholesale price list, and lists on 2,4-D weed killers as well as other chemicals for agriculture. Lists may be obtained from the company, 15th and California, Omaha 2, Nebr.

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Emulsifier Bulletin

Alrose Chemical Co., Cranston, R. I., has issued recently a new technical bulletin on "Nonisol 210," a polyoxyalkylene fatty ester used as an emulsifier for insecticides. The product is non-toxic, and is recommended by its makers for use with piperonyl butoxide and pyrethrum as well as hexaethyl tetraphosphate, DDT and chlordane. The bulletin may be obtained from the company, 180 Mill St., Cranston, Rhode Island.

•

Chlordane in New Drum

Julius Hyman & Co., Denver, Colo., have introduced a new aluminum clad steel drum to contain their refined grade technical chlordane. The container also displays the firm's new label for the first time. The drum, not returnable, contains 30 gallons of chlordane, weighing 400 pounds compared to the 700 pound weight of the steel drum formerly used. It has a fully-removable head, secured by a bolted ring seal. The unit price of chlordane is not affected by the new package, the firm states.

•

Du Pont Offers "Marlate"

A new methoxychlor insecticide, "Marlate" is being offered to the trade by E. I. duPont de Nemours & Co., Inc., Wilmington, Del. The new product acts either as a contact or stomach poison, and has residual qualities of rather long duration, the company states. Active ingredient is

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WANT TO SEE garden supply profits grow? Remind customers how nematodes, wireworms, mole crickets and other root-destroying pests can sap the life out of plants. Then push D-D* Soil Fumigant two ways and earn a *double* profit.

First, try using D-D on your own soil. You'll find plants and trees with pest-free roots are healthier, grow larger, have added selling value. And secondly, recommend that home gardeners treat their soil with D-D *before setting out* your pest-free stock.

Result: customers find D-D's pest-killing power helps grow bigger, more bountiful gardens. And that means they'll come back for more high-profit D-D, plus plenty of other garden supplies, as well.

For information on using and selling D-D, write the nearest office listed below

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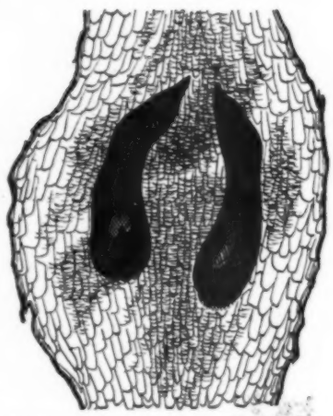
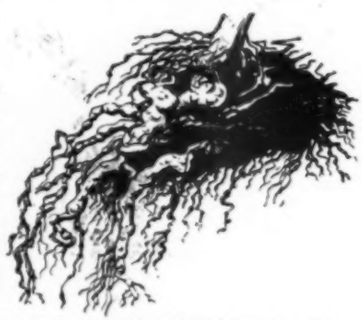


ROOT-KNOT NEMATODES (above) attack plants by entering feeder roots. Galls form, cutting off flow of nourishment



WITH ROOTS STRANGLED by galls, tomato plants become stunted, sickly, bear runt-size fruit

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bis(methoxyphenyl) trichloroethane, practically non-toxic to warm-blooded animals. Field tests have indicated that the material is safe to use on vegetables which are sensitive to certain other insecticides, and is effective in controlling insect pests of cabbage, peas, soybeans, peaches, early apples and grapes. "Marlate" may be used either as a dust or spray, and is compatible with most commonly used fungicides and insecticides, as well as a number of other duPont fungicidal products.

•

U.S.I. Develops New Test

U. S. Industrial Chemicals, Inc., New York, has developed a colorimetric method for the determination of piperonyl butoxide and various combinations. The new procedure is to be used in manufacturing control operations and in the examination of samples of finished insecticides by Government and State agencies. It is also expected to be of assistance to entomologists in the determination of residual deposits. The readings are done with the aid of a Klett-Summerson photoelectric colorimeter.

•

Bemis Plans New Plant

Bemis Bros. Bag Co. has announced plans to build a $2,000,000 plant to make paper shipping bags near Wilmington, Del. A twenty-two acre tract of land has been purchased for the construction of the new plant which will be the 28th such plant operated by Bemis Bros. in the U. S. When completed, the plant will employ some 400 persons. It will serve customers in the states of Delaware, Maryland, Pennsylvania and New Jersey.

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New Mill in Operation

Alabama Pulp & Paper Co., Pensacola, Fla., subsidiary of St. Regis Paper Co., has recently produced its first paper. The plant, just completed, is designed and equipped for the manufacture of special, heavy-duty multiwall kraft paper with a rated capacity of 250 tons a day. It is built on a site adjacent to the company's Florida Pulp and Paper mill.

Technical Briefs

Effect of 2,4-D on Corn

Small difference, if any at all is detectable in various types of corn sprayed with 2,4-D, according to tests recently made in the Rio Grand Valley, Texas. Both pre-emergence and post-emergence treatments were made. The entries were 37 inbred lines, 44 single-crosses and 19 Ohio certified hybrids. These were planted January 7, on two separate plots; one designated as Dr. Park's farm, Weslaco, Texas, and the other the Valley Experiment Station. A week later (January 14) Texas A. & M. Station also planted 35 entries of lines and single-crosses. The first four hills of each of the 505 rows were sprayed immediately after planting, with a mixture of four pints of 40 percent 2,4-D in five gallons of water per acre.

The week following January 7 was warm, and the corn came up rapidly. Observers on Jan. 20 saw an excellent stand, with no damage from the pre-emergence spray apparent at all. The week following the later planting, however, was cold, and the corn planted on January 14 germinated slowly. A below-freezing temperature killed the corn on Dr. Park's farm, but the later-planting of corn had not emerged and came up a few days later with about 75 to 80 percent stand.

An accurate check taken on February 10 indicated that four sprayed hills of corn had 2,196 plants, and the eight hills not sprayed, had 4,346 plants. This indicated that there was apparently no damage to the corn caused by pre-emergence spraying of 2,4-D.

On February 11, a post-emergence spray was applied at the rate-per-acre of 4/5 pint of 40 percent 2,4-D in five gallons of water. The four center hills in each row were sprayed, and some of the border rows received overdoses. In the afternoon the overdosed border rows showed damage as though scalding water had been poured on the plants. No damage was detected on any of the other treated hills, and they were carefully observed on February 12, 14 and 15.

The corn when sprayed, had been planted four weeks, and was from three to five inches high. It was considered that the corn would have been more tender if better weather had stimulated rapid growth, and perhaps this factor contributed to the lack of damage. However, the rate of application, 4/5 pint per acre instead of ½ pint per acre, was used, which indicated that there could be little, if any damage resulting from application of ½ pint per acre when used on thrifty corn.

Similar experiments were conducted on Dr. Park's farm with corn planted on January 13. These varieties included Iowa 306; Ohio W36; Os420; and 51A, treated and untreated in several different ways with 2,4-D. The corn, coming up following the freezing weather, was three to four inches high on February 14. The stand was checked, and no damage was noticeable despite the different methods of applying 2,4-D to the previous crop. (This corn will be left to mature, and will be checked a number of times. Three to five pollinations will be made on 27 of the inbred lines in each of the four hills receiving post-emergence treatment and the hills not treated.) This seed will be planted to determine further the effect of 2,4-D on seed which has been treated the previous season. The 100 entry plot will be duplicated this year in Ohio on the Ohio Hybrid Research Farm, Croton, Ohio.—*J. E. Van Fossen, Ohio Hybrid Seed Corn Producers, Croton, Ohio.*

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BHC Ear Tick Control

A preparation consisting of benzene hexachloride, in either xylol or benzene, and pure pine oil readily destroys all larvae and nymphs of the spinose ear tick, *Otobius megnini* (Duges), in the ears of heavily infested cattle. In addition, it affords protection against reinfestation for at least 17 days, wih serious reinfestation delayed a whole month according to Drs. H. E. Kemper, I. H. Roberts and H. O. Peterson, U.S.D.A. veterinarians. Other data included observations on the properties of BHC, such as its free flowing in cold-weather, and that it was easily applied without harm to the host animal by a modified type of ordinary spring-bottom oiler, at the rate of half an ounce inserted into each ear. The ear was massaged later to insure thorough distribution of the insecticide. The experiments were made during 1945, 46 and 47 in the Rio Grande Valley of New Mexico. Tests involved 3,178 head of cattle. Of this number, 117 were farm animals in 10 herds, examined frequently. The remainder were hereford range cattle, examined occasionally.

Early tests with a variety of insecticidal materials indicated that benzene hexachloride was more effective than all the other insecticides used, including DDT, according to the experimenters.

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Soil Reaction and Nutrition

Analysis of more than three thousand samples of Oklahoma soils showed a rapid increase in the percentage of soils low to very low in available phosphorus as the pH value declined below 6.2 (the approximate dividing line between slightly acid and moderately acid soils). Some non-acid soils were low in phosphorus due to lack of that element in the parent material. Available calcium also declined as the acidity increased. More calcium was present in fine textured soils than in sandy soils of the same pH value. Availability of magnesium was nearly as high in the strongly acid soils as in the non-acid group. Available potassium was usually low in strongly acid sandy soils.

—*What's New in Oklahoma Agriculture. January,* 1948.

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Control for Narcissus Rot

"New Improved Ceresan" and 2 per cent "Ceresan" are both effective in controlling narcissus basal rot caused by *Fusarium oxysporum* f. *narcissi* but frequent flower injury

results from their use. Hence an effective but safer treatment is desired. Five-minute after-harvest plus pre-planting dips of King Alfred narcissus bulbs either in "Mersolite 8" (phenyl mercuric acetate) at the rate of one pound in 800 gallons, or in "Puratized Agricultural Spray" (phenyl mercuri triethanol ammonium lactate), one part of the active ingredient in 10,000, in 1945 and 1946, have given control of basal rot equal to the standard. "New Improved Ceresan" treatment but without the flower injury. Rot has not been controlled so well when the bulbs were dusted with "Arasan" or with "Spergon" but bulb yields have been about the same as yields following treatments with mercurials. Beginning with 200 bulbs (weighing 284 oz.) per treatment in 1945 the bulb yields in 1947 after two years of treatment were: "New Improved Ceresan," 531.5 oz.; "Arasan," 523; "Spergon," 490; "Tersan," 393.5; "Mersolite 8, 522.5"; "Puratized Agricultural Spray," 435.5; and untreated 109.5 ounces. Similar results were obtained from treatments begun in 1946. A number of other materials have given either poor control or severe flower injury. —McClelland, W. D. *Phytopathology*, January 1948.

•

Pea Moth Control

In a summary of investigations into the biology and control of the pea moth during 1945 and 1946 in England, the *Journal of the Ministry of Agriculture* (1947, 54, 124-9) observes the life history of the insect under field and laboratory conditions, and experimental evidence is produced to show that the moth is incapable of passing through more than one generation in a year. Two principal wild hosts are named, viz., *Vicia Cracca L.*, and *Lathyrus pratensis* L. Three hymenopterous parasites are recorded, *Ascogaster quadridentatus* Wes., *Glypta haesitator* Gr. and *Hemiteles ridibundus* Gr.

The results of two variety trials are produced to show that varietal differences in susceptibility to pea moth attack do occur, and are associated chiefly with differences in time of flowering and rate of maturation, and with the degree of plant cover. Critical sowing dates resulting in maximum attack will thus vary for different varieties, and also with the season.

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2,4-D Report Presented

"Killing Weeds with 2,4-D," has been published recently by Drs. L. W. Kephart and L. S. Evans of the U.S.D.A. The paper is designated as number #97CC-January 1948. It reviews the progress of 2,4-D since its introduction in 1944 and points out that although not a poison in the ordinary sense, 2,4-D is a hormone-like material that causes serious disturbances in plants. Some of these effects are beneficial, such as causing apples to cling to the bough until ripe, while other effects are detrimental or even lethal. The material in weed control must be used so that weeds are killed, but other plants are not harmed. "This is obviously a delicate operation" the author states, "and one that cannot be used carelessly nor with a heavy hand. 2,4-D is a powerful weapon, and must be used as such."

Users of 2,4-D are warned to observe these precautions:

1. **Protect sensitive plants from 2,4-D spray, dust and fumes.**
2. **Use only minimum amount needed.**
3. **Check equipment carefully—faulty application is costly.**
4. **Have separate sprayer for 2,4-D, or cleanse carefully after use.**
5. **Use wisely and according to directions—2,4-D is not a cure-all.**

The nature of 2,4-D is described. Its action is much slower than that of other herbicides. The visible effects in plants, however, are always characteristic: bending and twisting of the stems, thickening and curling of the leaves, gradual change in color, usually to a yellow, and later to a brown.

The types of commercial 2,4-D are enumerated: sodium salt of 2,4-D; Amine salts of 2,4-D; esters; and dusts. 2,4-D is also compared with dinitro compounds as selective sprays: the two are about equally effective on most annual and winter-annual weeds when small, but 2,4-D has proved more effective when weeds are large or when conditions of low temperature or wet weather, or both, prevail. 2,4-D sometimes causes greater injury to cereal crops than dinitro compounds, and cannot be recommended at all in peas or other legumes. Injury to crops from dinitro compounds is a temporary burning of foliage, but 2,4-D injury is a permanent stunting effect or malformed growth, especially if applied at excessive rates.

As noted before, 2,4-D has different effects on various kinds of plants. Some are killed by the slightest trace of the substance, while others cannot be injured seriously by any quantity of 2,4-D that is practicable to apply. The paper states that in general, grasses are highly resistant to the material which makes it safe to spray lawns, grain fields and corn without injuring the crop. 2,4-D is at its best in killing broadleaved plants like wild mustard, cocklebur and ragweed.

The presence of 2,4-D in the soil is highly detrimental to germinating seedlings of nearly all plants, including the relatively tolerant grass crops. It has been found experimentally to remain in the soil under field conditions in sufficient quantities to cause severe injury to germinating seedlings for periods of from 2 or 3 weeks to as much as 3 or 4 months. The effect persists longer on heavy soil than on light soil and longer in cool, dry soil than in warm, moist soil.

"Under favorable conditions of rainfall and temperature, the cereal-and-grass-type crops can be safely planted on most soils 30 days after the 2,4-D treatment. Until further information is available, the seeding of legumes, vegetables, and other broad-leafed crops should be delayed until at least 60 days after 2,4-D treatment," the paper says.

Methods of applying 2,4-D are discussed. Satisfactory application can be made with a variety of spraying equipment ranging from small household and knapsack sprayers to large power-spraying units, and even airplanes for special cases. Equipment used depends upon the size of area to be treated. Uniform coverage on the leaves of the plant

(*Turn to Page* 81)

INDUSTRY NEWS

New Sales Group Formed

B. F. Goodrich Chemical Co., Cleveland, has formed a new department to handle sales of its new chemical products. Head of the new department is Samuel L. Brous, formerly manager of sales development for the company. He has been

SAMUEL L. BROUS

associated with the organization in Akron and Cleveland since 1929.

Products to be handled by the new sales group will include organic chemicals, and chemical intermediates as well as agricultural chemicals. Many of the products assigned to this group will be manufactured in the company's recently announced $3,000,000 plant to be built at Avon Lake, Ohio.

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N. Central AAEE Meets

The third annual conference of the North Central States Branch of the American Association of Economic Entomologists was held at the hotel Pere Marquette, Peoria, Illinois, March 25 and 26.

Officers elected at the meeting were Frank Wallace, Indianapolis, Ind., president; William Bradley, Toledo, Ohio, vice-president; and J. W. Apple, Urbana, Illinois, secretary-treasurer.

The advance program called for a business session for the first day, with Dr. H. M. Harris presiding. Later in the morning a general session on insecticides was planned, under the chairmanship of Dr. C. W. Kearns. Speakers on the program included personnel from the U. S. Department of Agriculture, the Illinois State Natural History Survey, and representatives of various mid-western agricultural experiment stations.

Sections were scheduled on cereal insects, forest entomology, and insects affecting man and animals, under the chairmanship of Drs. J. H. Bigger, H. A. Bess and R. J. Dicke, respectively.

A banquet was planned for Thursday evening, and night sessions were to follow, covering extension entomology and apiculture. Each group had co-chairmen: Drs. Harold Gunderson and F. G. Butcher; and R. L. Parker and W. A. Price, respectively.

Friday's program included sections on forage crop insects and fruit insects with Drs. Ray T. Everly and A. C. Hodson in charge. A business session in the afternoon was to complete the program. Dr. Harris was chairman of the final session.

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Meetings

Western Chapter, National Shade Tree Conference, Santa Barbara, California, May 20-22.

American Plant Food Council Third Annual Convention, June 13, 14, 15, 16, White Sulphur Springs, W. Va.

Pacific Slope Branch, A.A.E.E., June 14, 15, 16, Hotel Vancouver, Vancouver, B.C.

National Fertilizer Association, Annual Summer Meeting, June 21, 22, 23, White Sulphur Springs, W. Va.

Eighth International Congress of Entomology, August 9-15, Stockholm, Sweden.

A.I.F. Association Fall Meeting, September 7, 8, 9, Spring Lake, N. J.

Economic Poisons Control Officials, Second Annual Convention, October 9, Shoreham Hotel, Washington, D. C.

Amer. Ass'n. Economic Entomologists, New Yorker Hotel, New York, December 13-16, 1948.

Bickerton Heads Dept.

Dr. Jack M. Bickerton has been appointed General Manager in charge of the Insecticide Division of

J. M. BICKERTON

the Walker Fertilizer Company, Orlando, Fla. according to C. D. Walker, President of the organization. Dr. Bickerton is a graduate of the University of British Columbia at Vancouver and has a Ph. D. from Cornell University. He has served at the Dominion Experiment Station at Summerland, B.C. and as assistant sales manager and director of research in the agricultural division of Innis, Speiden and Company, New York.

•

S. W. Harman Dies

S. Willard Harman, assistant professor of entomology at New York State Agricultural Experiment Station, Geneva, N. Y., died March 17 at his home at Kashong, N. Y. Mr. Harman was 54 years of age.

A native of Geneva, N. Y., he had been with the Experiment Station since 1922, at which time he joined as a research assistant. He was a graduate of Michigan Agricultural College with the class of 1917, and received his M.S. from Cornell.

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Iowa Fertilizer Use Up

Dr. L. B. Nelson, Iowa State College agronomist predicts that Iowa's use of fertilizer material will reach an annual consumption of 700,000 tons "before many seasons." The state consumed some 250,000 tons in the 1947 season. Speaking before a farm group in the state recently, he asserted that through proper use of fertilization, a further increase of corn production may be expected. Fertilization has already helped to produce about 9,000 stalks of corn to the average acre, but this number can be raised to 14,000, in his opinion,

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Bamford Joins Geigy Co.

Geigy Company, Inc., New York, has announced the purchase of the insecticide and bag business of Basil A. Bamford, Houlton, Maine. who for the past 27 years has operated the business under his own name. Mr. Bamford will assume an executive position with the Geigy Co. in New York. As part of his new responsibilities, Mr. Bamford will supervise the Geigy dust mixing mills in Houlton and Presque Isle, Maine. He plans to make his home in Houlton during part of the agricultural season of Aroostock County.

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To New England Territory

Oscar A. Mockridge, Jr. has been appointed as New England field representative for the Celatom products department of Eagle-Picher Co., Cincinnati. His headquarters will be in New York. The product "Celatom" is a diatomaceous earth product used as a carrier for insecticides and in other industrial applications.

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To Ark. Co-op Position

S. L. Simpson, former mechanical superintendent for the Monsanto Chemical Company at East St. Louis, Ill., has been named assistant manager in charge of rough rice for the Arkansas Rice Growers Co-Operative Association at Stuttgart. He is a native of El Dorado, Ark.

Anderson in Senate Race

Secretary of Agriculture Clinton P. Anderson has announced his candidacy for U. S. Senator from New Mexico. Mr. Anderson plans to remain in the Cabinet until Congress adjourns, probably in June. However, his name will be entered in the New Mexico primary which is to be held on June 8.

Mr. Anderson has served as Secretary of Agriculture since 1945, at which time he was appointed by the President while serving his third term in the House of Representatives. At the time of the announcement, there was no official indication who Mr. Anderson's successor might be.

•

2,4-D Supply Predicted

A bulletin from E. C. Stone Co., Denver, Colorado, comments on the 1948 supply of 2,4-D as follows: "In the new recommendations for low-gallonage spraying for weed control, low-pressure power spraying

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machines are being offered by several manufacturers. It appears at this date that there will be 15 or 20 times as many power sprayers in the field in 1948 as there were in 1947. It further appears that this greatly increased number of power sprayers will greatly decrease the promptness with which 2,4-D manufacturers will be able to fill their 1948 requirements. Lower cost 2,4-D materials and lower cost power sprayers obviously will put weed control costs within the reach of many times more farmers than ever before."

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Thompson-H'ward Expands

Thompson-Hayward Chemical Company, Kansas City, has purchased a modern, new warehouse building at 123 South Main, North Little Rock, Ark., to establish its eighteenth office and warehouse in a key city of the Midwest. The concern manufactures agricultural and chemical compounds, cleaning compounds, and represents several manufacturers of related products, including acids, fertilizers, paint chemicals, soaps, weed killers, laundry chemicals, cotton dusts and insecticides. Robert F. Wagner will be manager. The firm was founded in 1917 in Kansas City by C. T. Thompson, who still is president. Other branches are in Texas, Minnesota, Illinois, Iowa, Nebraska, Colorado, Kansas, Tennessee, Oklahoma and Louisiana.

•

Fertilizer Meeting Dates

Convention dates have been announced by both the American Plant Food Council and the National Fertilizer Association. The A.P.F.C. will hold its third annual meeting at the Greenbrier, White Sulphur Springs, W. Virginia, June 13, 14, 15 and 16. The NFA convention will be held at the same place a week later; June 21, 22 and 23.

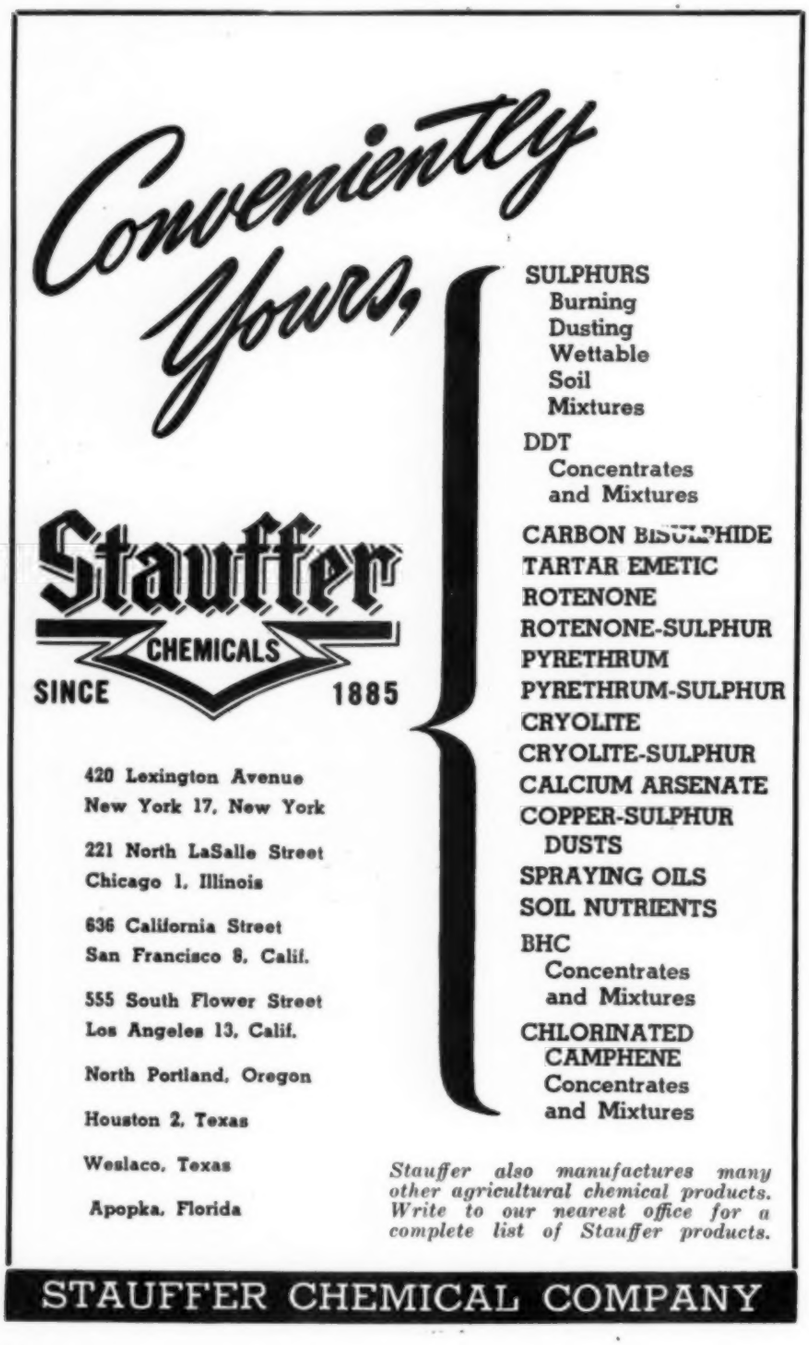
Complete plans for the conventions had not been announced by either association at press time, but full details will be included in next month's issue of *Agricultural Chemicals*.

•

More Fertilizer Coops

The demand for more fertilizer has induced Oklahoma farmers to launch plans for the first cooperative fertilizer factory in that state. Following a meeting at Holdenville, Okla., on Feb. 23, books were opened for sale of $200,000 of certificates of indebtedness in Consumers Cooperative Association, Kansas City, Mo., regional co-op, which will erect and operate the plant for the Oklahomans. Facilities for an annual output of 25,000 tons of mixed fertilizer will be provided.

Indiana Farm Bureau Cooperative Association has also informed members of plans for expanding its fertilizer production facilities. Recently this co-op completed and is now operating a superphosphate acidulating plant in Indianapolis, to supply its adjoining mixing plant. At the organization's annual meeting March 2 and 3, announcement was made that when potash becomes more readily available, the co-op plans to build additional fertilizer mixing plants.



Fertilizer Diverted

Between 12,000 and 16,000 tons of commercial nitrogen fertilizer manufactured by the Lion Oil Company at Little Rock, Ark., for export by the Army to western Europe will be released for distribution to southwestern farmers in time for spring planting. After emergency requirements of Louisiana and Arkansas farmers have been met, the equivalent of this quantity of fertilizer will be restored to the export program. Shipment of 6,000 tons to Finland was cancelled recently as a result of strong protests lodged with the United States Department of Commerce by Congressman Overton Brooks.

•

Pyrethrum Stocks Held

The British Board of Trade, whose contract with the pyrethrum growers expired December 31, 1947, has made a recent announcement in connection with its East African stocks of pyrethrum, it was reported by the Greene Trading Co., Inc., New York import firm. The Board of Trade announcement included the following three points:

1. Of the stocks held in East Africa, it is proposed to reserve 1,100 tons of the highest test flowers for sale, pari passu with new production of flowers.

2. A further 1,000 tons will be held in reserve in case the demand should exceed the available supply in 1948, but unless more than 700 tons of the above 1,100 tons are sold in 1948, the whole of this reserve stock will be condemned after the 31st of December, 1948.

3. All other stocks held by the Board of Trade have been condemned and are no longer available for sale on world markets and are to be disposed of under supervision of the Pyrethrum Board of Kenya.

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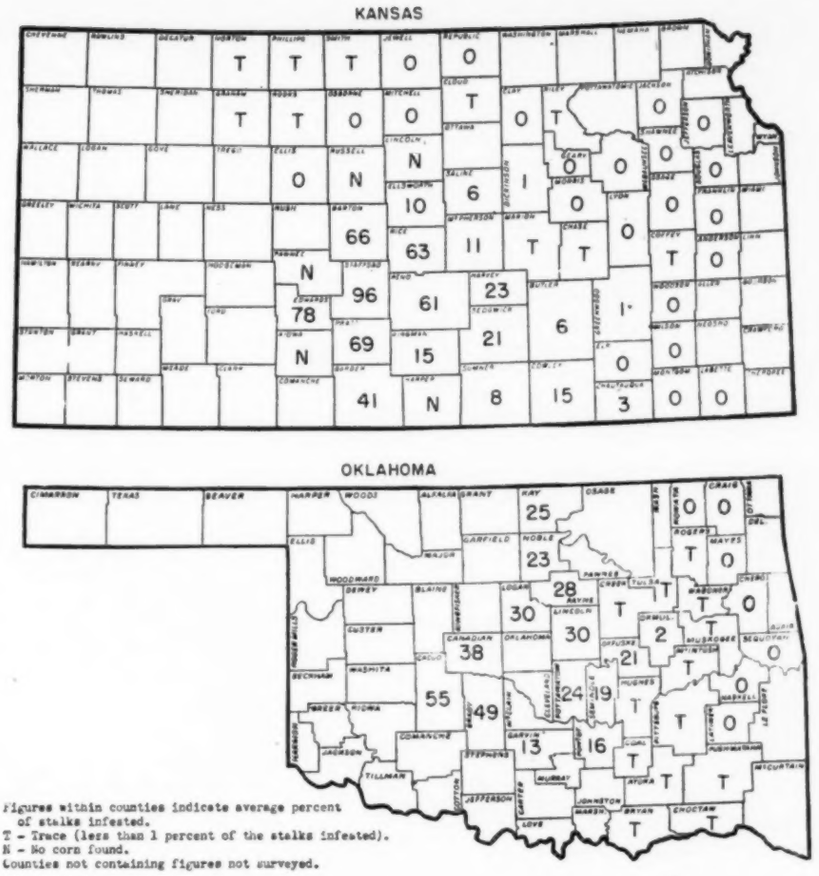
Packaging Exposition

The 17th annual Packaging Exposition and Conference of the American Management Association was scheduled to be held in the Cleveland auditorium, Cleveland, Ohio, April 25 through 30. A number of chemical manufacturers were included in the early listing of exhibitors.


KANSAS
OKLAHOMA
Figures within counties indicate average percent of stalks infested.
T - Trace (less than 1 percent of the stalks infested).
N - No corn found.
Counties not containing figures not surveyed.

Status of the southwestern corn borer in Nebraska, Kansas, and Oklahoma in the fall of 1947 was recently announced by the U.S.D.A. Bureau of Entomology and Plant Quarantine in a special supplement by H. H. Walkden, Division of Cereal and Forage Insect Investigations. The accompanying maps of Kansas and Oklahoma show the extent of infestation within their borders. No infestation was found in four Nebraska counties adjoining infested counties in Kansas.

At Recent Washington Fertilizer Meeting

—Photo Courtesy of American Plant Food Council.

One feature of the 45th annual convention of the Association of Southern Agricultural Workers in Washington, was a breakfast given by the American Plant Food Council on the morning of February 13. Pictured above at the speakers' table are (left to right): B. B. Jones, county agent, Orleans County, New Orleans, secretary-treasurer of the Association; Rep. C. R. Hope, chairman of the House Agriculture Committee; Senator Arthur Capper, chairman of the Senate Agriculture Committee; Clifton A. Woodrum, president, American Plant Food Council; Dr. R. Frank Poole, president of Clemson Agriculture College, Clemson, S. C., president of the Association; and W. A. Minor, assistant to the Secretary of Agriculture. Others at the headtable, but not shown in the photo, included Dr. W. T. Spantan, chief of the Agricultural Education Service, U. S. Offices of Education; Dr. W. V. Lambert, Research Administrator, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA; and Dr. M. L. Wilson, director of Extension Work, U. S. Dept. of Agriculture.

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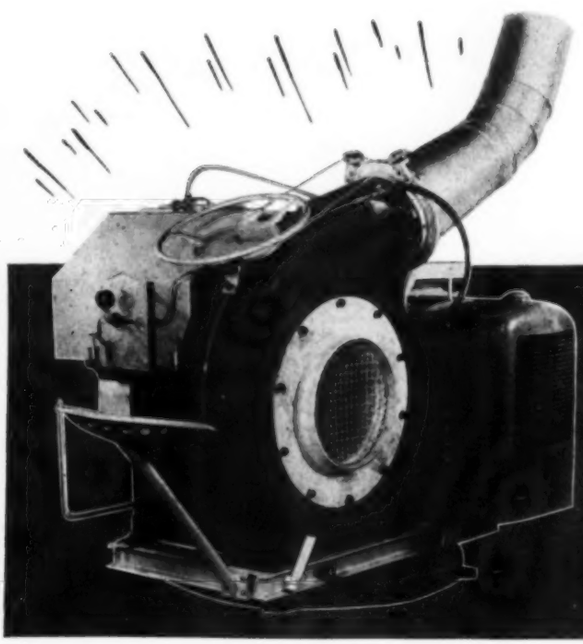

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SPRAYER

N. J. Mosquito Meeting

The 1948 annual meeting of the New Jersey Mosquito Extermination Association was scheduled to be held at Haddon Hall hotel, Atlantic City, April 13, 14, 15 and 16. In addition to the presentation of numerous papers on mosquito control, there was planned to hold an all-day exhibit and out-of-doors demonstration of the latest types of spray machines, insecticidal fog machines and other equipment used in agricultural insect control. Indoor booths were to exhibit other mechanical equipment as well as the products of chemical manufacturers. Thomas D. Mulhern is secretary of the Association.

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To Fertilizer Position

Kenneth Conrad, a graduate of Ohio State University, has been named plant supervisor of the new fertilizer factory which began operations for Consumers Co-operative Association at Eagle Grove, Ia., in January. Mr. Conrad has a broad background in commercial fertilizer production, ranging from formulation to plant management, the co-op announced.

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"1080" Warnings Issued

The Rodent Control subcommittee of the National Research Council has recently issued certain general precautions in the use of "1080" rodenticide. It recommends that the material be colored and properly labled to prevent mistaking it for baking powder or powdered sugar in a home. Dangerous amounts of the material may be inhaled, so operators should wear respirators when handling the powder. Clothing worn during this operation should be taken off carefully to avoid shaking off dust particles, dangerous to pets.

If operator's hands are cut or bruised, protective gloves should be worn, since "1080" is poisonous upon entering the body in this manner. The principal danger, however, is from ingestion. None should ever be swallowed, and operator should neither smoke nor eat while working with the compound. Hands must be washed thoroughly afterward.

All weighing, measuring and mixing equipment . . . all containers of "1080" must be properly labeled, washed immediately after using, and reserved for "1080" only. All such material should be locked up when not in use.

The rodenticide should be used only in commercial and business places, and on guarded municipal dumps by carefully instructed, reliable personnel under competent supervision. Not recommended where the public might be exposed to it . . . especially not in residential areas. Cats and dogs are particularly susceptible to "1080," and are killed by eating freshly poisoned rodents or dried carcasses. Therefore all pets must be confined or removed from poison area.

Obviously, all stock supplies, equipment and poisoned preparations must be kept out of the reach of irresponsible persons and children, pets, and livestock. The carcasses of rodents destroyed with "1080" should be burned or buried promptly.

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Arkansas Fertilizer Plant

Establishment of a co-operatively owned fertilizer plant to mix 15,000 tons or more of fertilizer yearly will be the principal 1948 project of the Arkansas Farm Bureau Federation, according to Clifford L. Smith, general manager of the group's co-operative unit. Members recently approved a proposal to construct and operate the plant for farmers within a 100-mile radius, and a $400,000 fund for construction, operation, maintenance and reserve is being negotiated by an executive committee. Savings are expected to amount to $4 to $6 per ton on present quoted prices of fertilizer. Cost of production and distribution to stores and local co-operatives would include the materials, approximately $4.50 per ton for mixing and bagging, $1.50 per ton for selling and shrinkage, and $5.50 per ton for freight and bags, or a total of $11.50 per ton above cost of materials.

Fertilizer produced at the proposed plant would be distributed on the basis of stock subscribed. Location of the plant would be determined by the section of the state subscribing the largest amount of stock. Individual farmers or local co-operatives would be eligible to buy stock, and the plant would be operated as a department of the Arkansas Farm Bureau Co-Operative, an affiliate of the Arkansas Farm Bureau Federation.

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New Continental Division

Continental Ore Company, New York, has announced the organization of a Chemical Division to handle its expanding activities in the chemical field. H. S. Ten Eyck, former vice president of the Southern Phosphate Corporation, will be in charge of the new division.

The new division head brings to the new post both technical and sales experience. He is a chemical engineer, and was vice president in charge of sales for the Southern Phosphate Corporation, where he became widely acquainted in the chemical and fertilizer fields.

The company gives as its chief reason for the move the increasing importance of chemical products in its operations. For the past 10 years, Continental has concentrated on the import and export of ores, minerals and metals, but today it finds industrial and agricultural chemicals playing a large part in both its present tonnage and future plans.

•

Powell Personnel Changes

According to an announcement by John Powell, president of John Powell & Co., New York, Harold L. Straube who has been associated with the firm for the past eight years in technical sales, has been advanced to assistant sales manager. Direction of company sales is in charge of Mr. Powell. He also announced that Dr. Robert C. Haring, formerly chief chemist, has been appointed director of plant and manufacturing operations. Dr. Haring, prior to his association with the Powell company, was a chemical engineer with the National Aniline Division of Allied Chemical & Dye Corp.

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...FINEST NEUTRAL INSOLUBLE COPPER I'VE EVER USED!"

FINEST because it's *micronized** with particles ranging from 2 to 5 microns in size.

Ask the man who uses MICRO NU-COP. He'll tell you its finer particles go into suspension in water quickly and easily, and do not clog spray nozzles or corrode equipment, as no lime is required. Used as a dust, MICRO NU-COP flows freely and does not irritate the operator as do old style copper-lime dusts. It's economical, too, because of greater dispersion and coverage.

This year stock MICRO NU-COP . . . the finest neutral insoluble Tri-basic Copper Sulphate, containing 53% metallic copper.

You can rely on Faesy & Besthoff for quick, economical deliveries of a complete list of agricultural products from warehouse stocks at Hicksville, Long Island.

* Reg. U. S. Patent Office by Micronizer Processing Co.

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Chemicals for Agriculture
220 E. 42nd Street, New York 17, N. Y.
PLANT AND WAREHOUSE, HICKSVILLE, L. I.

Mortimer Bader succeeds to Dr. Haring's former position.

William J. Pollert, associated with Powell for the past twenty years, and a vice-president, has been made director of all export and foreign activities of the company. Channing J. Fredrickson, entomogist with wide Latin American experience, becomes sales manager of the export department. Kenneth B. Nash has been transferred from the laboratory to technical sales. Dr. Alfred Weed, vice-president, and an officer of the company for more than twenty years, continues as technical director. The firm will complete twenty-five years in the manufacture of agricultural and household insecticide materials this summer for which time an anniversary celebration is slated, according to Mr. Powell.

•

Osmun Joins Purdue

John V. Osmun has joined the staff of the Department of Entomology at Purdue University, Lafayette, Ind., and will be largely responsible for the new courses being developed for the new four-year curriculum at Purdue for commercial pest control operators. Twelve men are at present enrolled in the new insect control course. Professor Osmun is a graduate of the University of Massachusetts with an M. A. from Amherst. During three of the four years which he spent in the Army, he served as entomologist in charge of pest control for the First Army Command. Since leaving the Army, he has been on the entomological research staff of Merck & Co., Rahway, N. J.

•

Dow Opens S. Haven Lab.

Dow Chemical Co., Midland, Mich., has announced the opening of new quarters for its field agricultural chemicals research division in South Haven, Michigan. "Open house" was held on March 4, with fruit growers of Michigan invited to attend. In charge of the division is Dr. Walter C. Dutton. The South Haven building contains some 9,000 square feet of floor space and houses office, laboratories, and shop facilities. Similar groups for field testing of the company's agricultural chemical products are located at Midland, Mich., and at Seal Beach, Calif.

•

New DuPont Section

E. I. DuPont de Nemours & Co., Inc., Wilmington, Del., have announced the creation of an agricultural product development section, as a part of the Grasselli Chemicals Department. Manager of the new group is Bertel C. Nylen, who has been with the DuPont Company since 1930. The new agricultural section will handle only new products. The regular line of established agricultural products will continue to be handled through the Agricultural Chemicals Section.

At the same time it was announced that the specialty products and technical service sections of the Grasselli Department had been combined into a new group called Industrial Product Development and Service Section. Its function is to promote and service all new non-

GEIGY NOW ADDS 3 NEW PESTICIDES
TO THE LINE THAT MADE DDT FAMOUS

GY-BEN
(BENZENE HEXACHLORIDE)
A benzene hexachloride formulation containing 6% gamma isomer.
GY-PHENE-40
(CHLORINATED CAMPHENE)
A dust base containing 40% chlorinated camphene primarily for use in preparing dusts for cotton-pest control.
GY-COP "53"
(INSOLUBLE COPPER)
A chemically stable insoluble basic copper sulphate containing 53% metallic copper for use in preparing sprays or dusts.
Geigy

And don't overlook these widely used Geigy DDT compositions. They also represent opportunity to manufacturers and processors of packaged insecticides for the retail trade.

NEOCID* D-30

A solution containing 30% Geigy DDT (by weight) for dilution with liquids, to control flies, mosquitoes, bedbugs, cockroaches, fleas and certain other insects.

GESAROL* VD-50

A finely-ground powder containing 50% Geigy DDT. For general agricultural use after addition of diluents to formulate DDT dusts adapted to control specific pests.

Geigy Company, *"Originators of DDT Insecticides"* are now broadening their base of operation in the field of pesticides. These three new Geigy products have been tried and proven. They are of traditional Geigy quality. Use them with confidence in dust mixtures for agriculture. They will help you build business. Your inquiries are invited.

**Reg. U.S. Pat. Off. Insecticidal Compositions containing DDT are covered by Reissue Patent No. 22,922*

GEIGY COMPANY, INC.
89 BARCLAY STREET, NEW YORK 8, N. Y.

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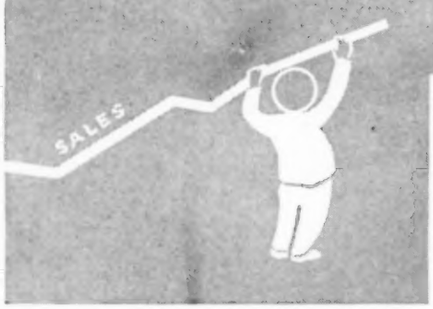
What **ATLAS** Research has done to help sales of **YOUR INSECTICIDE**



Atlas has been experimenting for many years to produce active, non-ionic insecticide emulsifiers that can be used in any type of water available . . . emulsifiers that can be used at comparatively high concentrations without harm to plants and farm animals . . . emulsifiers that make the spray go further, spread better.

Atlas research has produced emulsifiers with these characteristics. They are being successfully used with many of the newer toxicants such as chlordane, benzene hexachloride, toxaphene, DDT, and many others.

Atlas non-ionic emulsifiers definitely tend to keep rust to a minimum, thus retarding deterioration when the mixtures are stored in cans. And you can list most Atlas emulsifiers as *active* on your labels for a majority of purposes, because they do have certain insect-killing power by themselves.

Atlas research is at your service. Write for further information and trial samples of emulsifiers to suit your own needs.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

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agricultural chemical products of the department. Richard W. Thatcher, manager of the specialty products section since 1944, heads the combined section.

•

Dr. Bishopp Honored

Dr. Fred C. Bishopp, assistant chief in charge of research, bureau of entomology and plant quarantine,

DR. F. C. BISHOPP

U.S.D.A. was recently presented by the British government the award of "His Majesty's Medal for Service in the Cause of Freedom." The medal came through the British embassy in Washington.

The decoration, presented to Dr. Bishopp for his work of coordinating research on insect carriers of disease and destroyers of food, crops, and clothing, was ". . . in recognition of the valuable service . . . rendered to the allied war effort in various fields of scientific research and development."

Dr. Bishopp is the second U.S.D.A. man to be honored by the British government. The other was Dr. E. F. Knipling, who during the war directed entomological research at the Orlando, Fla. laboratory.

•

FitzGerald to New Post

Dr. D. A. FitzGerald has been appointed by Secretary of Agriculture Anderson as director of the office of Foreign Agricultural Relations. Dr. FitzGerald returns to the USDA after an absence of nearly two years during which time he has been Secretary General of the International Emergency Food Council, and its successor, the International Emergency Food Committee.

•

Freeport Names Wight

Freeport Sulphur Co., New York, has elected Charles A. Wight, as chairman of its executive committee. Mr. Wight was vice-president of Bankers Trust Company, New York before joining Freeport on April 15. He is a graduate of Yale.

Protecting Seed Corn

Three per cent of DDT in pyrophyllite protected seed corn from a number of insect infestations without affecting germination. Lower concentrations were also insecticidal but not so desirable. Mixtures of a number of fungicides such as ethyl mercuric phosphate and tetramethyl thiuram disulfide with DDT were apparently compatible and did not affect seed germination. A. L. Hamner, *J. Econ. Entomol.* 40, 574-5.

Make formulations effective and easy

TREM and TREX

EMULSIFIERS and SOLUBILIZERS

TREX 40 for DDT emulsifies solutions in which the customary DDT solvents have been used.

TREX 80 for Chlordane to provide concentrates without solvents which can be readily diluted with water to form non-settling, clear solutions.

TREX 45 for Toxaphene dissolves as high as 50% of Toxaphene, and following water dilution gives stable emulsions ready for immediate field use. Also provides excellent emulsions with solvent solutions of Toxaphene.

TREX 60 for Chlordane to provide high concentration emulsible insecticide formulations with kerosene.

TENLO-10 for HETP to give better wetting characteristics, increased coverage and control.

TREM-014 and TREM-024 for emulsifying solvent solutions of various organic insecticides and herbicides wherein special properties are desired in finished formulation.

Write for samples and descriptive literature

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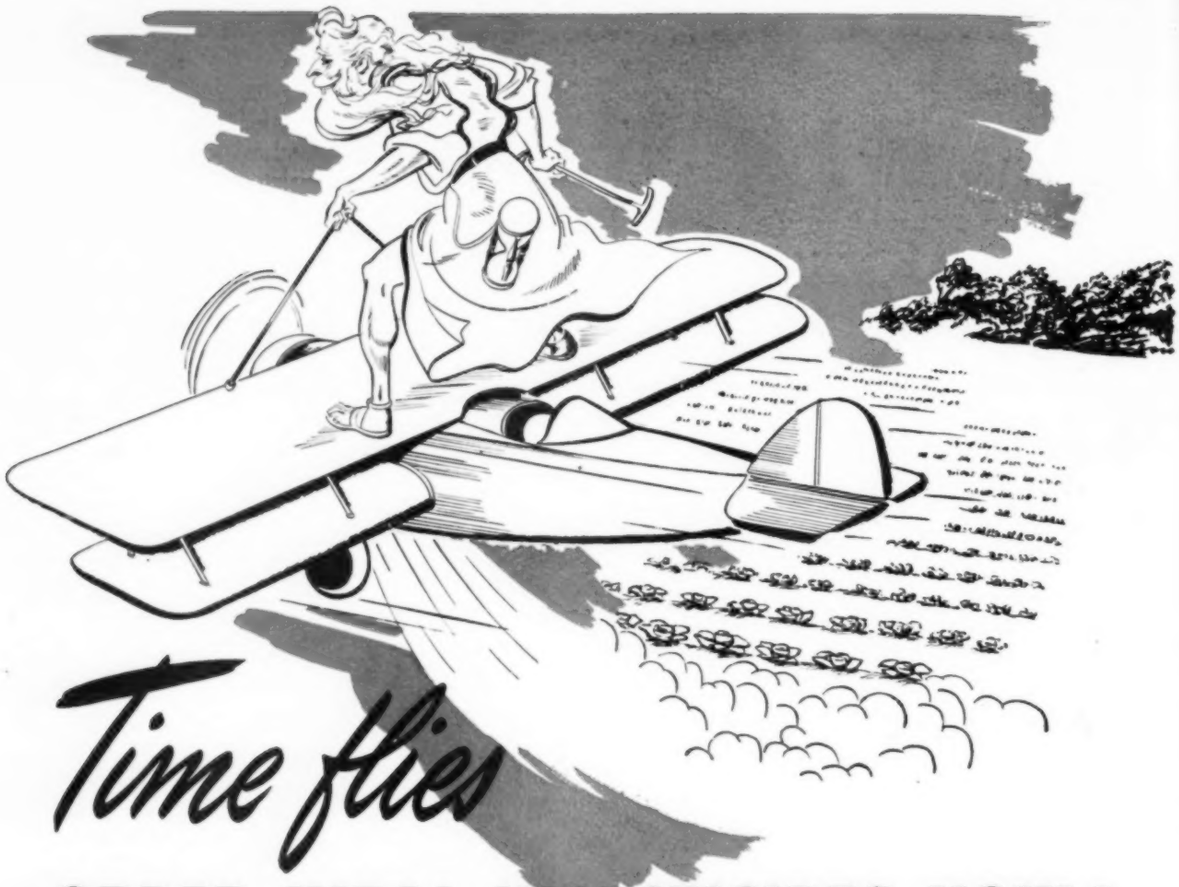


Time flies

ORDER VITAL INSECTICIDES NOW!

Mixers and distributors are urged to indicate their minimum insecticide requirements *now*. Pennsalt, one of the foremost producers of DDT, BHC and other chlorinated agricultural chemicals, is now stocked to handle orders for the growing season. Requests now will insure delivery without running the risk of delayed deliveries later on.

This "order-now" procedure will enable Pennsalt to serve you better by setting aside enough chlorine and other basic chemicals to do your job . . . chlorine that may otherwise be used in the manufacture of other important chemicals.

When you deal with a *basic* producer like Pennsalt, you are sure of a dependable source of supply—because Pennsalt produces essential raw materials . . . processes them . . . and delivers the finished products to you at fair prices.

For full details on the following chemicals . . . including price, delivery, technical information . . . write: Agricultural Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas.

PENN SALT

AGRICULTURAL CHEMICALS

- Pentech—finely ground, free-flowing DDT
- Penco® DDT Technical
- Penco WB-50® Wettable Base 50% DDT
- Penco® DB-50 Dust Base 50% DDT
- Penco® Cattle Spray
- Penco® Calcium Arsenate
- Penco® BHC Technical—36% Gamma Isomer
- Penco® BHC 12% Gamma Isomer both wettable base and dust base
- Kryocide®—*Natural Cryolite*
- Penco 2,4-D Weed Killers
- Penite® 6 Weed Killer (Sodium Arsenite)
- Penphos (Parathion)
- Penphene® D-40 (Chlorinated Camphene—40% dust base)

New Phosphate Mine Begins Production

Projected output of the new Noralyn phosphate mine and plant (above) built near Bartow, Fla. by the International Minerals & Chemical Corp., is 1.5 million tons per year. This production will be the greatest from such a mine in the western hemisphere, according to the company. When production from the new mine is coupled with that of the company's Peace Valley and Achan mines nearby, the total phosphate output is expected to reach 3.5 million tons annually. Life of the new mine is estimated at about a quarter of a century.

New Name for Mathieson

The Mathieson Alkali Works, Saltville, Va., has changed its name to Mathieson Chemical Corporation, according to an announcement by the company. The change in name is to identify the firm with its diversified line of products.

•

Bonnell to New Position

Chemical Corporation of Colorado, Denver, has announced the appointment of Dr. Daniel E. Bonnell as vice-president in charge of sales. The new appointee has had a wide and varied experience in government service and in the chemical industry. He holds degrees from the University of Washington, and a Ph.D. from the University of Oregon. He was an instructor at the latter school until shortly after the outbreak of the war, at which time he was commissioned as a First Lieutenant, U. S. Army Medical Department. He worked successively as a laboratory officer, assistant medical inspector at the San Francisco port of embarkation; as the chief medical inspector at the San Francisco port of embarkation; and as chief medical inspector at Ft. McDowell, Calif. While in the service, Dr. Bonnell was instrumental in developing water purification techniques which are standard on all ocean-going vessels at the present time. He was discharged from the army with the rank of Lt. Colonel.

Upon leaving the armed forces, he joined Velsicol Corporation, Chicago, and later the Julius Hyman Co., Denver. Dr. Bonnell took up his new duties at Colorado Chemical Corp. on March 20.

•

Suggests Insecticide Name

A letter from R. M. Lewis, Imperial Chemical Industries, Ltd., New York, discusses the nomenclature of benzene hexachloride. He points out the confusion in the trade arising from differing names by which the insecticide is known. He writes, "In the past a certain amount of confusion has existed regarding the nomenclature of the insecticide benzene hexachloride or hexachlorocyclohexane. Considerable publicity has been given to the outstanding insecticidal properties of benzene hexachloride and particularly the gamma isomer of benzene hexachloride under the name 'Gammexane' since this word was coined and adopted by Imperial Chemical Industries Ltd., London, England for use in connection with their new product, following its introduction by them in February 1945. We should like to point out that the name 'Gammexane' has been registered over a large part of the world including the United States by Imperial Chemical Industries, Ltd., as a trade name for the gamma isomer of benzene hexachloride and formulations containing this isomer.

"The name 'Gammexane' should therefore only be used to describe the appropriate products of Imperial Chemical Industries, Ltd., and should not be used as a generally descriptive term for benzene hexachloride or insecticidal compositions made therefrom."

•

More Texas City Data

A recent report made by the Office of Technical Services, U. S. Department of Commerce states that the explosion of ammonium nitrate a year ago at Texas City was caused by a preliminary explosion of the gases produced in the fire which preceded the major explosion.

The O.T.S. has been investigating the possible causes of the disaster for some time. The mechanism of the explosion was visualized approximately as follows:

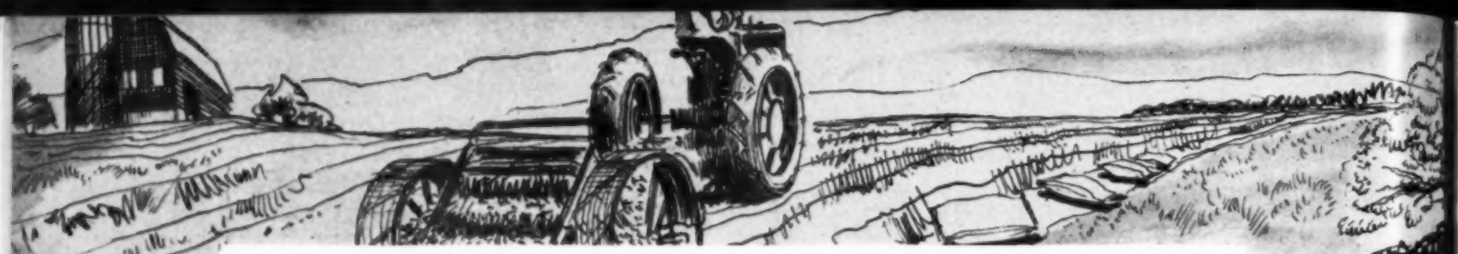
Paper bagging or wooden supports were accidently ignited. Slow combustion followed, with the ammonium nitrate, rather than the air, supplying the oxygen to keep the fire burning. The heat melted additional nitrate causing it to react with the coating wax, paper bagging and wood to produce a gaseous mixture of carbon monoxide, nitrous oxide and heavy acid gases.

This heavier-than-air mixture displaced the air in the hold, and the gas pressure increased after the hatch was battened down. When this closely confined gaseous mixture reached its lower limit of concentration for ignition, it exploded.

•

Mist-Blower Meeting Held

A two-day mist-blower conference was held at the Connecticut Agricultural Experiment Station, New Haven, March 24 and 25, under the sponsorship of the Connecticut Tree Protective Association. Nearly 200 persons were in attendance. The first day was featured by a demonstration of mist-blowing equipment at the East Rock Park athletic field, New Haven. Ten manufacturers were represented at the demonstration. These included the Accurate Tool Co., Newark, N. J.; John Bean Manufacturing Co., Lansing, Mich.; Buffalo Turbine Co., Gowanda, N.Y.; Lawrence Aero-Mist Co., Greenfield, Mass.; H. P. Starner, Scarsdale, N.Y.; Ray Landis, Davy Tree Expert Co., Old Greenwich, Conn.; G. E. Tirrell, Greenfield, Mass.; R. E. Cooley, Somers, Conn.; Fitzhenry-Guptill Co.,



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When a St. Regis packer is filling multiwall paper bags with fertilizer—you have a great team! This economical operation steps up production, yet demands only one man to handle it. That starts things off well.

Customers like multiwalls. They like their neatness and compactness for storage, and the way they *protect*. When a St. Regis multiwall is opened, out flows the fertilizer, dry and free.

You are invited to talk over your needs with our nearest St. Regis sales office.

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E. Cambridge, Mass.; and J. M. Corliss, U.S.D.A., Greenfield, Mass.

On the second day of the meeting, papers were presented on pest control in shade trees, and the role of the mist applicator in accomplishing this end. Speakers included Dr. J. G. Horsfall, director of the station; J. M. Fennell, president of the Connecticut Tree Protective Ass'n.; Dr. R. B. Friend, R. A. Spencer, Philip Garman, and Dr. G. H. Plum, all of Connecticut Agricutural Experiment Station; Dr. S. F. Potts, and B. H. Wilford of the U.S.D.A.; Dr. F. L. Howard, Rhode Island Agricultural Experiment Station; K. G. Parker and J. L. Brann, New York Experiment Station; and William Luckner, vice-president of the Conn. Tree Protective Ass'n., chairman of the meeting.

•

U.S.D.A. Toxicants Bulletin

The Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture has issued a precautionary bulletin warning against the use of certain toxicants on foodstuffs or on the edible portions of treated crops. It urges users to consult state or federal authorities for recommendations before making use of these materials.

Benzene hexachloride is to be used only on early season application on fruits such as peaches, and is not recommended for use on vegetables, the bulletin states. It also reports that "undesirable flavors have occurred in poultry products when this material has been used to control certain poultry pests. For some purposes, however," the bulletin continues, "such as for control of insects on cotton, benzene hexachloride is a valuable insecticide when used according to recommendations."

Users of older insecticides, such as the arsenicals and fluorides are reasonably informed about precautions which must be employed, the U.S.D.A. points out, and considerable information on the toxicity of DDT is available to indicate the use of similar precautions when spraying or dusting with this material. The Food and Drug Administration is quoted as stating that so far the possible residue hazards of the newer toxicants are not fully known, so for the present it advises that "in the interest of safety, these newer materials be used only where it is known that residues will not remain or can be effectively removed from the plants after harvest. . . .

"Research and experience emphasize the need for caution in applying all poisonous insecticides. Two of the new materials, parathion and tetraethyl pyrophosphate present unusual hazards in application. Special caution should be exercised to avoid exposure in the handling of these materials," the bulletin concluded.

Please

When writing to AGRICULTURAL CHEMICALS, address all correspondence to our New York address, 254 West 31st St., New York 1. Circulation, advertising and editorial offices are all at this address. The magazine is produced and mailed in Baltimore, but all mail sent there must subsequently be forwarded to New York. The phrase "Publication Office" on our masthead is required by the Post Office Department.

•

New DDT Product

Pennsylvania Salt Mfg. Co., Philadelphia, has announced production of a new-type technical grade DDT, to be marketed under the trade name "Pentech." The product can be made directly into finished dusts without the necessity of using 50 per cent concentrates, the company states.

N. W. INSECT CONFERENCE

(*Continued from Page 53*)

For cabbage maggot in plant beds, pre-treatment of the soil might prove effective. In small test plots at Mount Vernon, 5 percent gamma isomer BHC was applied at 20, 40, 80, and 160 pounds per acre and worked into the top 3 inches of soil before planting seed. The cabbage seedlings were not injured by even the strongest dosage. In fact, those in the treated plots were more vigorous. The 3 strongest dosages gave over 98 percent clean plants and the lightest 72 percent, with protection lasting over two months. Similar results were obtained in Oregon with even stronger doses showing no injury. The use of BHC would be much cheaper than the calomel dust previously used.

Emulsions containing BHC in transplanting cabbage caused a serious stunting in all but one test. Dipping plants in a suspension of BHC prior to planting also caused injury. The reason for injury to plant roots, when seedlings will flourish in soil containing many times the amount, is not yet known. Chlordane did not cause injury, with some indications that it would do practically as well as BHC on control.

BHC is also effective for control of cabbage aphid. Tests so far indicate that at least one percent gamma isomer is needed. The advantages over nicotine are that it kills better at lower temperatures, has some residual effect, is cheaper, and in any case will be used for weevil control. The odor is of no consequence in cabbage seed production since no part of the plant is used for food.

The cabbage seedpod weevil (*Ceutorhynchus assimilis*) appears at about the bloom stage and attacks cabbage grown for seed by laying eggs in the developing pods where the eggs hatch into grubs that destroy the seeds. A series of test plots at the Northwestern Washington Experiment Station at Mount Vernon show BHC to be definitely superior to other materials tried for its control. A 0.5 percent gamma isomer BHC dust applied four times averaged only 15.8 percent infested pods as compared with 40.6 percent for the untreated check. In the same series, 1.5 percent gamma isomer dust brought the infestation down to 6.2 percent and three percent dust to 4.8 percent infested pods. Chlordane and chlorinated camphene at 5 percent had about 21 percent each, and the previously recommended dust containing pyrethrum had over 30 percent in-

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fested pods. Considering the small size of the plots and the active nature of the insect, these results are encouraging. In larger plots, on a commercial scale, the results were similar: BHC gave 7 percent; chlorinated camphene, 17 percent; pyrethrum, 23 percent; and DDT, 26 percent infested pods.

A new or a newly introduced European species of aphid has appeared on lettuce grown for seed in southwestern Idaho and Malheur County, Oregon. Applications of a spray containing DDT and nicotine sulfate were outstanding for control of onion thrips. In experiments conducted at the Twin Falls Idaho, laboratory of the Bureau of Entomology and Plant Quarantine in 1946, plots of Southport Yellow Globe onions which received five weekly applications of this spray yielded 15,100 pounds more onions per acre than untreated plots. Promising results were obtained with BHC, chlordane, chlorinated camphene, and a mixture of DDT and HETP. Dianysil trichloroethane (methoxy DDT) was relatively ineffective. Calomel is an effective control of onion maggot but impairs germination and growers are trying to get away from it. Sabadilla affords control but has no residual effect. One pound DDT per acre in formaldehyde gives control. Now, mostly four percent DDT dust is used.

Sugar Beets, Tomatoes

DDT stood out above all other insecticides in control of beet leafhopper on sugar beets. Sprays are the most effective in the Northwest on account of weather conditions. Combinations of insecticide with herbicide kill mustard, other weeds and leafhopper at the same time. The development of varieties of sugar beets resistant to the leafhopper-borne curly top disease makes it profitable to grow beets in areas inhabited by the leaf hopper. However, when large numbers of leafhoppers occur in the beet fields when the crop is in an early stage of growth, these resistant varieties may become infected with the curly top disease to the point that reduced yields may occur. Experiments with several insecticides were conducted during 1947. These experimental plots totaled 141 acres of sugar beets, and tests were made with chlordane, DDD, HETP, chlorinated camphene, and DDT. With the exception of various formulations of DDT, none of these materials was effective against the beet leafhopper. The addition of pyrethrum extract, sulfur, or HETP, did not increase the effectiveness of DDT.

Lygus bugs were damaging to beets and celery. They feed on celery petioles causing swelling and subsequent cavities. There is a similar effect on beets, which also may develop multiple crowns (four or five tops). Three percent DDT at thirty pounds per acre by ground machine gave excellent control. Five percent DDT is required for application by airplane. The beet plants must be protected during seed formation if germination injury is to be avoided.

The Western tomato blight

STAUFFER

7 COTTON DUSTS

STAUFFER COTTON DUST NO. 122
Contains 3% Gamma BHC (Benzene Hexachloride)
5% DDT (Dichloro-Diphenyl-Trichloroethane)
57% Sulphur

STAUFFER COTTON DUST NO. 82
Contains 20% Chlorinated Camphene—47% Sulphur

STAUFFER COTTON DUST NO. 12
Contains 34% Calcium Arsenate—66% Sulphur

STAUFFER COTTON DUST NO. 22
Contains 5% DDT—82% Sulphur

STAUFFER COTTON DUST NO. 22-1
Contains 10% DDT—75% Sulphur

STAUFFER COTTON DUST NO. 82-1
Contains 10% Chlorinated Camphene—70% Sulphur

STAUFFER COTTON DUST NO. 102
Contains 3% Gamma BHC—68% Sulphur

PEANUT DUSTS

STAUFFER PEANUT WORM DUST NO. 22-2
Contains 2.5% DDT—88% Sulphur

STAUFFER PEANUT DUST NO. 402
Contains 90% Sulphur—3.4% Metallic Copper

"MAGNETIC" NATURAL CRYOLITE

SULPHURS

"MAGNETIC—70"
CONCENTRATED SULPHUR PASTE

"MAGNETIC—90"
MICRON MEASURED DUSTING SULPHUR

"MAGNETIC—95"
MICRON MEASURED SPRAYING SULPHUR

"PERFECTION" BRAND DUSTING SULPHUR
Contains 93% Sulphur—7% Conditioning Agent

has the answers to your Spraying and Dusting Problems

Stauffer CHEMICALS SINCE 1885

(curly top) is transmitted by beet leafhoppers. During April and May a statement is issued to growers as to the prevalence of and prediction with regard to beet leafhoppers to guide them in their control operations.

Aside from the beet leafhoppers, the three most important tomato insects are thrips, tomato fruitworm and tomato pinworm. The cavities that develop in the blossom end of the fruit are frequent harboring spots for thrips which feed on the walls of the cavities.

Hornworms which occur in the southern part of California are well controlled by calcium arsenate or cryolite. Dianysil trichloroethane and chlorinated camphene were similar in effectiveness while five percent DDT was ineffective against these pests. An outbreak of yellow striped armyworm which started to migrate from alfalfa was stopped by the application of five percent DDT or five percent DDT dust barriers.

Against the bean cutworm, the state of Colorado is using successfully five percent DDT dust by airplane at a rate of twenty-five pounds per acre. The same procedure gave good control in Idaho.

Although celery was not listed on the program, representatives from Utah brought up the control of yellows and of western mosaic. Yellows are transmitted by the six spotted leafhopper but is not much of a problem thus far. Western mosaic is transmitted by aphids that overwinter on the common weeds along the fence rows. They take to the fields in June; in July populations may be high.

Some of the various pests of berries and similar small fruits had been fairly well covered in connection with discussions of earlier features of the program, leaving only certain items for further consideration. Aphids which transmit strawberry yellows virus were not adequately controlled by DDT. However, it was noticed that periodic dusting with BHC five percent dust of 0.5 percent gamma content at a rate of twenty pounds per acre to repel deer did control the aphids and also appeared to control yellows virus. The field, which was rogued heavily, was the only one given tags for certified plants. Rotenone has usually been used to control spittle bugs but was in short supply. So growers changed to one-half or one percent DDT dust which proved fairly effective.

Figures were presented showing the control of orange tortrix and mites on cane fruits. The observations in the Northwest correlate with those in California, i. e., the larvae are present every month of the year; there are about sixty hosts; the eggs are laid on smooth surface material; the egg masses are never more than fifty percent parasitized; the insect attacks bud parts, preferably flower buds; and overwintering occurs in the buds. The pest first appeared in the Northwest in 1938 and has increased year by year. DDD, two pounds plus one quart foliage oil emulsion per one hundred gallons of water, afforded best control; cryolite, three pounds plus one quart foliage oil emulsion per one hundred gallons water was second; but these measures cannot be

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recommended now due to residual difficulties.

When cranberry vines were brought West, the pests were brought also. In the East the vines are flooded for from eighteen to twenty-four hours and that disposes of the pests. This procedure is not feasible in the West. Cranberry fireworm which was the worst pest has been thoroughly controlled by use of one quart of "Blackleaf Forty" per one hundred gallons of water. The worm seals itself within its host within twelve hours so that action must be prompt. Since nicotine is scarce, the spray program has been two pounds of fifty percent wettable DDT to one hundred gallons water which gave good control of the first brood. The second brood appears when about two-thirds of the blossoms drop and was controlled by dianysyl trichloroethane in a spray which also controlled the fruitworm. Later sprays where necessary were either rotenone-pyrethrins mixture or six pounds rotenone to one hundred gallons water. Dianysil trichloroethane affords protection for two or three weeks, after which there is no residue. The other insect problems of cranberries are not too serious. DDT helps control San Jose scale in migratory stage, and its use is a specific treatment against oystershell scale. Cranberries are not deciduous, hence they require large quantities of spray. The cranberry root weevil may be controlled by DDT.

Don J. Caffrey, Division of Crop Insects, USDA Bureau of Entomology and Plant Quarantine, Washington, D. C., was present and enumerated some of the spectacular and erratic results with parathion. One month after its use as an aerosol in a greenhouse, residual effects sufficed to kill all insects on newly introduced plants. It is toxic to insects long after it is possible to detect any residue by usual methods. It will be hard to handle in the laboratory unless the residual effect can be guarded against. Two milligrams per kilogram of body weight in eight days killed all rats treated. Others reported that 0.3 lb. per gallon of water injured azalias, and that one-quarter percent dust eliminated aphids on hops.★★

NAMING FUNGICIDES

(*Continued from Page 49*)

chemists in the formulation of a design to regulate name selection. This procedure does not seem pressing at the present time because the number of insecticides and fungicides involved is relatively small. Random selection is thus the easy way out. At the present time, trivial name establishment can be made possible through the facilities of the Interdepartmental Committee of the Federal Governmen of which S. A. Rohwer is chairman. Mr. Rohwer has agreed to cooperate with the plant pathologists in contacting the various organizations concerned such as the American Chemical Society, the Food and Drug Administration, etc. Mr. Rohwer's help in pre-empting common names from commercial trade-marking, has been assured.

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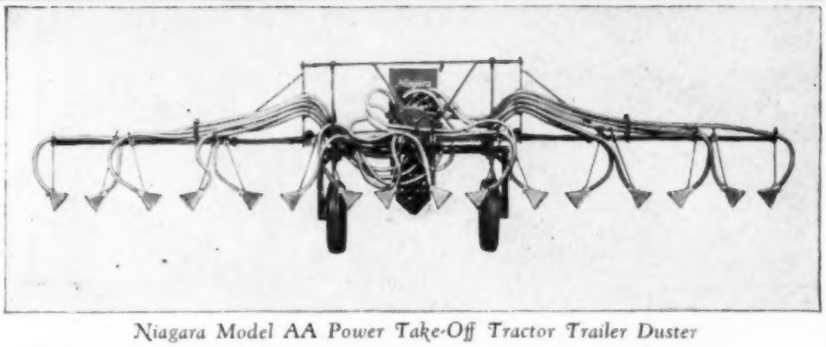

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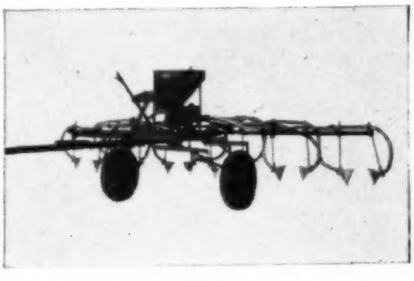

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one organization attempting to establish common names of any one class of agricultural chemicals. Otherwise even more confusion might very readily result. Manufacturers should make every effort to work through established committees in the various fields because this problem concerns them directly. Anyone interested should feel free to express his ideas with the hope that a common understanding will eventually be evolved. At the present time, it is obvious that there is a difficult job ahead in seeking acceptable names for various fungicidal materials.★★

MINOR ELEMENTS

(*Continued from Page 32*)

as those of U.S.D.A. laboratory at Cornell University, tend to stress that the vitamin content of a plant is not due entirely to the mineral nutrition of the plant, but to its hereditary characteristics and also the climatic conditions to which it is subjected. Thus there was evidence with certain crops that the light factor was particularly important in modifying the vitamin C content of plants.

In general it is fundamental to any concept of plant nutrition to stress that green plants, at least those of chief agricultural importance, synthesize from carbon dioxide, and water, with the aid of the energy of sunlight, all the organic substances used in their own growth or later utilized in animal nutrition. Mineral elements are obviously essential for the synthesis of these organic compounds, but just how the synthesis is influenced by any particular micro-nutrient element must be learned by further research. The micro-nutrient elements, like the vitamins, form a chapter of immense importance in our knowledge of plant and animal nutrition. Yet the fact that the knowledge of vitamins and micro-nutrient elements is comparatively recent and sometimes even dramatic, should not lead to wide general claims unsupported by evidence. In each specialized problem in these scientific fields the wise course is to seek the knowledge possessed by an expert acquainted with the local conditions involved.

This article does not cite references to the literature of the relation of micro-nutrient elements to plant growth, which, it has been estimated, may now number more than 10,000. It is only desired to record for those who wish to pursue the subject further that an excellent small monograph has been published recently by Walter Stiles,* and there is available the very complete abstract bibliography of the Chilean Nitrate Education Bureau.

* Trace Elements in Plants and Animals—MacMillan Co., N. Y. 1946.

POTASH INDUSTRY

(*Continued from Page 26*)

nological advance, and responsible management which represent the highest expression of American industry.

This is well illustrated by late figures on production [3] for 1947, the first six months of which saw an increase of 57,373 tons of K_2O, an in-

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crease over last year's output of slightly more than 12 per cent. Factors entering into the need for this stepped-up production include a vastly increased consumption of fertilizer materials in the midwestern states which in past years had used comparatively little; and greatly expanded usage of potash in sections of the country where consumption was already high.

With improved mechanization in potash mines and other operational economies, however, increases in the fiscal year of 1948-49 should bring the production rate to some 1,120,000 tons of K_2O, an increase of close to 100,000 tons, or 10 percent over the current year.

Factors governing imports are difficult to determine due to uncertainties of demand from the Orient, and the prices asked, varying from 95c to $1.33 per unit K_2O, depending upon the place of origin. The American market price is 37½c per unit, f.o.b. Carlsbad, N. M., or $22.50 per ton; and at Atlantic ports, the cost per unit, including freight, is about 60c per unit, or $36 per ton. It is pointed out by the American Potash Institute[3] that there has been no increase in potash prices since 1937, but rising freight rates have brought the unit cost up to the point where it now is.

[3] J. W. Turrentine, *Better Crops With Plant Food, January*, 1948.

LISTENING POST

(*Continued from Page* 48)

cline in all southern areas during the first half of March. However, this pest was fairly numerous in tobacco plant beds in Gadsen County, Florida toward the middle of the month.

Cucumber beetles were reported as causing only slight injury to crucifers in South Carolina, Georgia, and Florida. Toward mid-March the spotted cucumber beetle caused slight damage to lettuce in the Charleston district of South Carolina.

The onion thrips was very abundant on onions in southern Texas and in the Coachella Valley and in Los Angeles County of California during late February. The infestations were on the decline in southern California toward the middle of March although they were still causing some damage.

Cutworms were causing moderate injury to lettuce in South Carolina and were present in limited numbers in the Everglades district of Florida during the latter part of February. They were numerous in sugar beet fields of southern California early in March and were causing slight injury to lettuce in the Charleston district of South Carolina.

The cabbage aphid caused serious injury to cabbage and cauliflower in parts of southern California and in the lower Rio Grande Valley of Texas during late February and early March. Aphids were also numerous on turnip and radish in the latter district and the turnip aphid was numerous on turnips and mustard in South Carolina toward the middle of March. Aphid infestations were light to heavy on celery, potato, toma-

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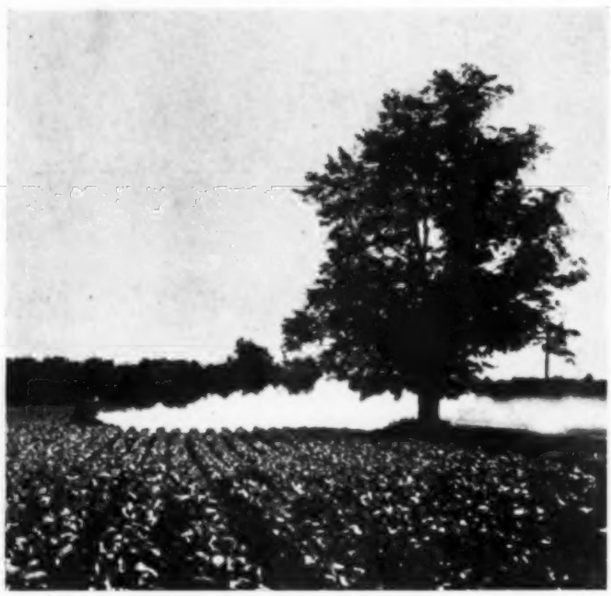

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to, pepper, squash and cucumber in Florida during the last half of February and first half of March. Light infestations of the green peach aphid occurred on crucifers and wild hosts in northwest Florida during late February and early March but none were found on tobacco seedlings.★★

PROGRESS DESPITE PESTS

(*Continued from Page 29*)

not only mean greater income to the farmer but also increasing food supplies for our own consumers and the people overseas.

Future Needs Seen

A RECENTLY published U.N. report states that the population of the world has grown by two hundred million in the last decade. This population growth has an important bearing on the future role of the pesticide industry. In the United States alone our population has grown 11 percent—by 14 million— within the last decade. Though Europe has just fought the most destructive war in history, her population is now 21 million greater than when the war began. When we talk of a goal of getting world food production back up to prewar levels, we are talking about a food supply which would give the world's population a ten percent *poorer* diet than they had before the war.

Some progress is being made now toward correcting the situation, and how far we can go, is not known. But this much is certain—long after we have ceased shipping large quantities of our food to those people, there will be a market for pesticide materials and tools which can aid in increasing agricultural production in other countries.★★

2, 4-D PROSPECTS

(*Continued from Page 36*)

7,000,000 acres will be treated in Western Canada from which they expect an additional 21,000,000 bushels of wheat through weed control. They are even looking ahead a few years to the treatment of 25 million acres for increases of from 50 to 100 million additional bushels.

This industry, in the production of these new chemicals has certainly kept faith with the nation and the farmers of the nation by producing new and better products. The importance of the standard methods of pest and insect control that have been so successful over the years—should not be passed over lightly—the arsenicals, paris green, cryolites, copper products, sulfur, pyrethrum and many other products. They, too, have and will continue to do yeoman service in the great fight on insects.

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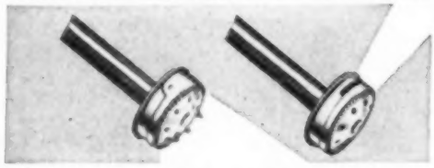

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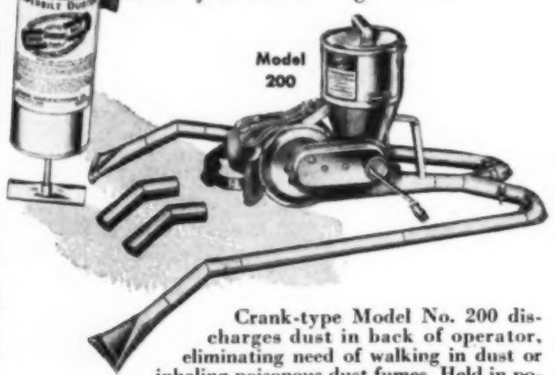

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Mul-si-mo is a thin amber-colored oily liquid about the same viscosity as Kerosene Oil.

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There is nothing complicated about the use of *Mul-si-mo*. It is just poured into the oil to be treated at the rate of ½ to 1%, depending upon the tightness of emulsion desired—then thoroughly stirred—and the process is completed.

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Mul-si-mo, we believe, is the cheapest and most economical Emulsifier on the market for the emulsification of the oils above specified.

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Extensive tests have shown *Mul-si-mo* to be non-toxic to plants when used at a dilution of 1 to 100. (Plants used in tests —Coleus.) As summer oils are usually used at the dilution of half-gal. to 100 gals. water, at such dilution the rate of *Mul-si-mo* to water would be 1 to 20,000.

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Per Gallon $4.00; 5 Gallons and up @ $3.75 per Gallon; 50 Gallon Drums @ $3.50 per Gallon, f.o.b. New York or Jersey City.

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or expense, by additional use of the proper pest and weed control products and by their usage do a great service to the nation and to the world.

The amount of money requested for our share of the first year of European aid, large though it is, would not be such a strain upon the national economy, if the farmer would first of all use the modern methods for controlling weeds and thus increase crop yields. If, next, the farmer would protect his growing crop with the necessary amounts of insecticides and then if any and all handlers of grain, feed and food would protect this food and feed against the ravages of these pests, the desired results can be accomplished.

All persons connected with the great industry of raising, transporting, storing or using food and feed products should be educated in the importance of the home garden as a vital aid in our fight for more food as well as for the effect the home garden will have on the individual's cost of living. The program for this industry's cooperation in this tremendous necessary project has been well conceived and the farmers and citizens of the nation, when properly informed how they can aid this program, will certainly give it their most enthusiastic support.★★

TECHNICAL BRIEFS

(*Continued from Page 58*)

with a minimum run-off or wind drift are essential requirements. Spraying pressures of from 30 to 100 psi give best results. High pressures are unnecessary and wasteful and increase drift danger, the authors say.

Time for applying 2,4-D is determined largely by the stage of growth of the weed, and in the case of selective sprays, by the stage of growth of the crop plants. In general, treatments have been most effective if applied when weeds are succulent, or at least in an active stage of growth.

The rate of spraying 2,4-D is expressed in pounds of 2,4-D acid per acre and in gallons of a certain percent solution per square rod, The former is usually mentioned when large areas are to be treated. For smaller jobs, the other system is preferred.

Pre-emergence weedings with 2,4-D are discussed, with reports of promising results particularly in corn. In this method, grassy weeds as well as broad-leaved weeds are controlled. It appears to be more satisfactory on heavy soils than light soils, and does not work well if the soil is stony.

The influence of climatic and soil factors on results with 2,4-D is described with reference to soil moisture, air temperature, air humidity, wind, rainfall immediately after treatment, and dew. Information is also given regarding the re-treatment of perennial weeds, and a list of precautions to be observed in using the material.

A comprehensive list of weeds and crops is presented, with information on their response to 2,4-D. These classifications cover the range of susceptible, intermediate, and resistant plants.

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VEEGUM

Toxicant
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Ask For Our Pamphlet

ENTOMA

A directory of pest control materials . . .

The new Seventh Edition of **ENTOMA**, published by the Eastern Branch of the American Association of Economic Entomologists, is now available. Listings include insecticides, fungicides, weed killers, spray machinery and their manufacturers, pest control operators, airplane sprayers, commercial arborists, etc.

Price $1.00. Add 20¢ for mailing.

Write to
George S. Langford, Editor
College Park, Maryland

Industry Patents

The following patents have recently been issued by the U.S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U.S. Patent Office, Washington 25, D.C.

2,436,478. DEVICE FOR PRODUCING AEROSOLS. Patent issued February 24, 1948, to Arthur W. Lindquist, Chester N. Husman and Herman O. Schroeder, Orlando, Florida, assignors to the U. S. of America, as represented by the Secretary of Agriculture. A device for producing aerosols comprising a container for holding a liquid, an air pump in said container, said container having a plurality of apertures for the discharge of air from said pump, capillary tubes on the outside of the container, each terminating at a point in the path of air discharged from one of said apertures, a valve, said capillary tubes being connected to the outlet of said valve, a shield slidably mounted on said container for covering the ends of said tubes when the device is not in use and for uncovering said ends when the device is to be used, a hood secured to said container in the line of movement of said slide for engaging the end of said slide when the slide is in a position covering said ends, a dip tube within the container having one end connected to the inlet of said valve and the other end disposed near the bottom of said container, said pump having a reciprocable plunger rod extending from the bottom of the container, the outer end thereof being provided with a handle to fit against the bottom of the container when the plunger is in a retracted position.

2,436,919. FLY SPRAYS COMPRISING AN N-ALKYL-PHTHALIMIDE AND DDT. Patent issued March 2, to S. I. Gertler and H. L. J. Haller, Washington, D. C., assignors to the U. S. of America as represented by the Secretary of Agriculture. A method of destroying flying insects comprising contacting said insects with a composition containing a member selected from the group consisting of N-butylphthalimide and N-amylphthalimide as its essential knockdown agent and 2,2-bis (p-chlorophenyl)-1,1,1-trichloroethane as its essential active insecticidal ingredient.

2,436,920. FLY SPRAYS COMPRISING AN N,N-DIALKYLCINNAMIDE AND DDT. Patent issued March 2, 1948, to S. I. Gertler and H. L. J. Haller, Washington, D. C., assignors to the U. S. of America as represented by the Secretary of Agriculture. A fly spray comprising a member selected from the group consisting of N,N-dipropylcinnamamide and N,N-diisopropylcinnamamide as its essential knockdown agent and 2,2-bis (p-chlorophenyl)-1,1,1-trichloroethane as its essential active insecticidal ingredient, incorporated in a mineral oil carrier.

2,437,170. VALVE BAG FILLER. Patent issued March 2, to William R. Peterson, Oswego, N. Y., assignor to St. Regis Paper Co., New York. Apparatus for filling valve bags comprising a scale beam, a bag support mounted on the load end of the beam and comprising a spout adapted to enter the valve of a bag, a housing having a discharge opening normally in line with the spout, means to drive powdered material and air from the housing through the opening and spout into a bag thereon, a gate for the opening, a spring urging the gate toward closing position, mechanical means for opening the gate, a latch for holding the gate open, means releasing the latch when the load end of the beam descends in response to a charge in a bag on the support, a clamp for clamping a bag on the spout, means connected to the gate and releasing the clamp when the gate is closed, a spring operated pusher for discharging a filled bag, mechanical means for compressing the last said spring and a latch for hold-

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ORGANIC PHOSPHATE
INSECTICIDE
Eston
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Tetraethyl Pyrophosphate—Technical
BETTER KILL
LOWER COST
This amazing new basic insecticide material is a revolutionary improvement on standard HETP for control of aphids, spider-mites and other insects.
Eston TETRON has approximately twice the strength of standard HETP and the price per unit of active ingredient has been drastically reduced.
AVAILABLE IN 3 FORMS:
TETRON 100
A straight chemical containing 100% active ingredients.
TETRON 50
50% active ingredients plus 50% solvent and emulsifier.
TETRON 25
25% active ingredients plus 75% solvent and emulsifier.
Eston TETRON is manufactured under the same close chemical and biological control that characterizes Eston HETP. Each plant run is checked before shipment to guarantee uniformity of performance.
Immediate delivery — substantial quantities. Write or wire for full price and technical information.
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One of the nation's foremost producers of agricultural chemicals and soluble mineral salts.

We can supply any mixtures of soluble mineral salts, copper, manganese, zinc and iron.

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TENNESSEE TC CORPORATION

ing it compressed, means connected with the gate for releasing the latch when the gate is closed, and timing means connected with the pusher for delaying the effective discharging action of the pusher for a predetermined interval after the gate is closed before the bag is discharged.

2,437,427. INSECTICIDAL COMPOSITIONS COMPRISING A PHENYL ESTER OF CAPRYLPHENOXYACETIC ACID. Patent issued March 9, 1948, to William F. Hester, Drexel Hill, and W. E. Craig, Philadelphia, Pa., assignors to Rohm & Haas Co., Philadelphia. An insecticidal composition comprising as a toxic agent a water-insoluble, organic solvent-soluble phenyl caprylphenoxyacetate dispersed in a carrier.

2,437,527. INSECTICIDAL COMPOSITIONS FROM HALOCAPRYLPHENOXYACETIC ACID. Patent issued March 9, 1948, to Wm. F. Hester, Drexel Hill, and W. E. Craig, Philadelphia, Pa., assignors to Rohm & Haas Co., Philadelphia. An insecticidal composition comprising as a toxic agent a halocaprylphenoxyacetic acid and a carrier therefor.

Trade Mark Applications

DAMPO, in Stymie bold caps, for insecticides. Filed Aug. 5, 1947, by Stauffer Chemical Co., San Francisco. Claims use since May 18, 1945.

THIO DENOXO, in hand-drawn capital letters, for insecticides. Filed Aug. 15, 1947, by Stauffer Chemical Co., San Francisco. Claims use since Aug. 29, 1946.

DENOXO, in black capital letters, for insecticides. Filed Aug. 15, 1947, by Stauffer Chemical Co., San Francisco. Claims use since Apr. 5, 1945.

DAMPOSUL, in black capital letters, for insecticides. Filed Aug. 25, 1947, by Stauffer Chemical Co., San Francisco. Claims use since May 18, 1945.

GAMMASUL, in black capital letters, for insecticides. Filed Aug. 25, 1947, by Stauffer Chemical Co., San Francisco. Claims use since Sept. 12, 1946.

TRIANGLE, in arched capital letters, with a triangular figure below, for sulfur. Filed Aug. 25, 1947, by Stauffer Chemical Co., San Francisco. Claims use since June 12, 1917.

ARROW, in slanting capital letters, with drawing of arrow as background. Filed Aug. 25, 1947, by Stauffer Chemical Co., San Francisco. Claims use since June 12, 1917.

CAL-META. In bold capital letters, for insecticides. Filed Aug. 25, 1947, by Stauffer Chemical Co., San Francisco. Claims use since Mar. 19, 1947.

BIOQUIN. In sans serif capital letters, for chemical products for use as agricultural insecticides, fungicides, and herbicides. Filed July 28, 1947, by Monsanto Chemical Co., St. Louis. Claims use since Feb. 7, 1947.

DIVOBAN. In gothic capital letters, for insecticide. Filed July 19, 1948, by the Diversey Corporation, Chicago. Claims use since Nov. 26, 1946.

IN-SEC-TOL. In capital letters, for insecticides. Filed Sept. 8, 1947, by J. W. Quinn Drug Co., Greenwood, Miss. Claims use since April, 1919.

GY-TET. In capital typewriter type, for insecticides. Filed July 29, 1947, by Geigy Co., Inc., New York. Claims use since May 19, 1947.

GY-PHENE. Same as above, for insecticides. Filed Sept. 13, 1947, by Geigy Co., Inc., New York. Claims use since June 30, 1947.

3422. For Parathion in wettable powder, dust, aerosol, emulsion or solution form, for use as an insecticide, rodenticide, fungicide, fumigant, acaricide, herbicide, arthropodicide and bacteriocide. Filed Sept. 23, 1947, by American Cyanamid Co., New York. Claims use since Sept. 15, 1947.

SPRAYSUL. In capital letters, large at each end of the word, for wettable sulfur. Filed Oct. 7, 1947, by Tennessee Corporation, New York. Claims use since 1938.

WIL-WEED. In shadow letters. For herbicides. Filed May 21, 1947, by The Glidden Company, Cleveland. Used since June 4, 1946.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 1st of month.

Positions Open

Insecticide Sales: Experienced man with at least ten years in insecticide sales or sales management wanted by leading manufacturer in the field. Should know the industry and be known. Excellent opportunity. Send full details, experience, salary, etc., to Box 236 care of Agricultural Chemicals.

Agricultural Technician: To take charge of new products, labels, etc., for plant growth control chemicals, insecticides and soil fumigants. Must be able to travel. Reply stating qualifications, salary required, etc. Address Box 237 care of Agricultural Chemicals.

Positions Wanted

Insecticide Act: Lawyer past five years experience large manufacturer in Food, Drug & Cosmetic Act, Insecticide Act, labels, contracts, etc., will act as house counsel for firm in these fields. For further details, communicate Box 238 care of Agricultural Chemicals.

Commercial Entomologist: Over 10 years practical experience sales, service and research in Washington, Oregon and California on insecticides, fungicides and herbicides. Graduate work on coast and in mid-west. 31 years of age. Interested in sales position with basic producer with aggressive sales plans. Address Box 239 care of Agricultural Chemicals.

Miscellaneous

Wanted: Company manufacturing well-known brand of agricultural insecticides (several exclusive) desires distributors in good territories. Must be able to bill own accounts. Address Box 241 care of Agricultural Chemicals.

ALVIN J. COX, Ph.D.

Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands; Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISOR ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street
Palo Alto, California

Wanted to Buy: Manufacturer will purchase going business producing chemical or other specialties for the agricultural, drug, household products, or allied fields. Old established firm interested expanding into specialty field. Give details in confidence either direct or through attorney. Full exchange references. Address Box 240 care of Agricultural Chemicals.

•

Pacific Slope AAEE Meets

The Pacific Slope Branch of the American Association of Economic Entomologists has announced that its 32nd annual meeting will be held at the hotel Vancouver, Vancouver, B. C. June 14, 15 and 16. Roy E. Campbell, secretary and W. J. O'Neill, chairman, state that the program will include a symposium on "mites which attack agricultural crops," and on "new insecticides."

On the entertainment side, an informal get-together will be held on Sunday evening, June 13, and a dinner-dance on Tuesday night. Although the meeting will be held in Canada, the group anticipates a large attendance from the U. S., and also numerous representatives of the Entomological Society of British Columbia as well as Canadian entomologists.

•

Propp to Western Office

Nordberg Manufacturing Co., Milwaukee, Wisconsin, has announced the transfer of Harold N. Propp to its San Francisco District office. Mr. Propp will assist T. D. Davis, manager of Norberg's Crusher and Process Machinery Divisions in that district.

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WHERE are your sales and advertising headed? Are you directing your advertising message specifically to the markets that you want to reach? Or are you advertising in a general way in so-called general media hoping that here and there you may hit a reader who might eventually have some remote interest in you and your products?

If it happens that you want your advertising to be a specific message aimed directly at the field of chemicals for agriculture, we know of no more complete or effective coverage than that offered in the pages of

AGRICULTURAL CHEMICALS

254 WEST 31st STREET **NEW YORK 1**

TALE ENDS

THE Schrock Fertilizer Service, Congerville, Illinois has recently installed mobile radiotelephones in two company-owned automobiles, making it possible for field and company personnel to be in constant communication with the home office which is located midway between Peoria and Bloomington.

Thus if a field man is talking to a farmer in the country, or if he is traveling down the highway and a question arises which requires assistance from the office, the occupant of the car has but to call the home office and get immediate information. The Schrock organization, large distributors of phosphate rock, is probably the first agricultural firm to make use of this two-way radio communication device.

•

Bragging again, but it's cold fact! An advertiser in *Agricultural Chemicals* who used a page last fall to offer a piece of large-scale spray-dusting equipment received over 200 inquiries from this one advertisement. Try that on your advertising piano some time!

•

Germany's once gigantic nitrogen-fixing industry, which before the war produced some 700,000 tons of nitrogen, is expected to turn out less than half of that quantity this year. Where she formerly exported around 100,000 tons annually, this year an estimated 400,000 tons of nitrogen will be sent to Germany.

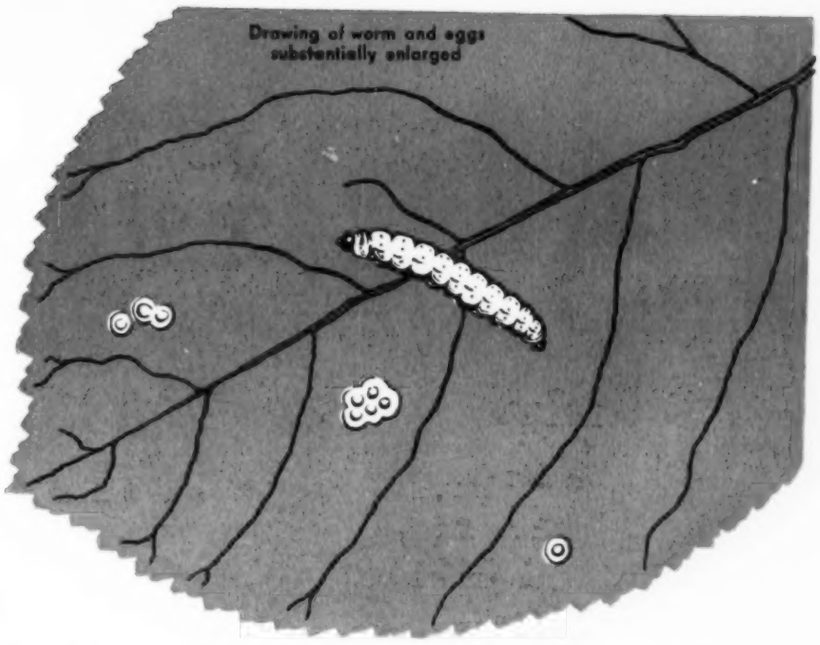
•

Research sometimes leads the scientist into strange by-paths in his quest for knowledge. Take for instance the detour taken by Professor Alfred C. Kinsey of the zoology department of Indiana University. He it is who wrote the much-discussed book on "The Sexual Behavior of the Human Male" . . . a volume receiving its full share of attention both favorable and otherwise. Many of the readers think he should have stuck to zoology.

WATKINS PRINTING CO., BALTIMORE

CODLING MOTH

{Carpocapsa pomonella}

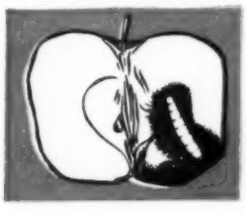


BUG OF THE MONTH

THIS month we give you the codling moth —scourge of the apple tree. Unchecked, it infests 20 to 95% of the entire crop. Even with the best of pre-war control measures, injury usually ran from 5 to 10%. In fact, this pest has become so deeply indigenous that it has put whole sections of the country out-of-bounds for apple growing.

Here is a real challenge to your manufacturing and marketing skill. For, with some of the newer insecticide materials at your command, used in accordance with the latest extension service recommendations, this trend can be reversed.

According to the best present information, DDT in water suspension, with DN 111 or other suitable Red Mite control added to prevent unbalanced buildup, is the most effective spray. Such a spray gives excellent mortality and has excellent residual action.



We suggest that you plan to use Prentox Micro Mesh Wettable DDT Powder (50% DDT) in your sales program for 1948. The use of this specially-formulated material will assure uniform coverage, optimum suspension, and tenacious residues on foliage and fruit.

Regardless of your present source of toxicants, our ideas on effective and economical formulations for sale to farmers, orchardists, nurserymen and home gardeners may be had without obligation. The specialized knowledge of our entire technical staff is always at your disposal, for consistently better insecticides.

R. J. PRENTISS & CO., Inc.

110 WILLIAM STREET, NEW YORK 7, N. Y.

BOX 1407, RICHMOND, CALIF. 9 SO. CLINTON STREET, CHICAGO 6, ILL.

PRENTOX PEST-TESTED INSECTICIDE CONCENTRATES SOLD TO INSECTICIDE MANUFACTURERS ONLY

TOXAPHENE

(HERCULES CHLORINATED CAMPHENE)

Here is *another* pest control problem solved by Toxaphene*. In widely increasing use this year among cotton farmers throughout the nation, to control the boll weevil and other insects, Toxaphene [Hercules Chlorinated Camphene] is also demonstrating its effectiveness in combating the grasshopper.

Tests by the U. S. Department of Agriculture and other qualified authorities show that dusts or sprays made with Toxaphene will rapidly kill the grasshopper and stop further migration of this pest.

Specific recommendations on the use of Toxaphene can be obtained from individual state authorities. For technical information on this toxicant as an ingredient in finished dusts and sprays, write:

TOXAPHENE ALSO KILLS

BOLL WEEVIL
BOLLWORM
SOUTHERN GREEN STINK BUG
COTTON LEAFWORM
COTTON APHID
RAPID PLANT BUG
TARNISHED PLANT BUG
COTTON FLEAHOPPER
THRIPS
MANY OTHER
AGRICULTURAL INSECT PESTS

HERCULES POWDER COMPANY

INCORPORATED

970 MARKET ST., WILMINGTON 99, DELAWARE

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